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GOLDING (F. D.). **Locusts in Nigeria.**—*Trop. Agriculture* **11** no. 12 pp. 308–312, 6 refs. Trinidad, December 1934.

During 1929–34 swarms of *Locusta migratoria migratorioides*, Rch. & Frm., *Nomadacris septemfasciata*, Serv., *Schistocerca gregaria*, Forsk., and *Anacridium moestum melanorhodon*, Wlk., appeared in Nigeria, but only the first species was of major importance. The previous general infestation of Nigeria occurred at the end of the 19th century, and was undoubtedly caused by *Locusta*. An outline is given of the invasion by it that began in 1929. A table, the result of biometrical studies of 900 individuals from swarms, shows the wing and femur measurements in all the generations ; the wing-femur ratio in 1934 was 2·11 in males and 2·17 in females, as compared with 2·17 and 2·19, respectively, in 1929. A table of the dates of spring and autumn hatchings in different provinces is included ; in areas north of 9°30′N. Lat., they usually occur at the end of April and in September.

Nomadacris is confined to the coastal strip in the southern half of British Chad, where hoppers were very abundant in 1930 and 1931. The adults spend the dry season in tall grass [*cf. R.A.E.*, A **22** 620]. Some swarms of *Schistocerca* were recorded in 1929 and 1931, but apparently this species does not breed in Nigeria. Two swarms of *Anacridium* were recorded in Sokoto in 1933 and 1934.

A bait of 30 lb. base (bran or sawdust) mixed with a solution of 12 oz. sodium arsenite in 8 gals. water was found to be the most effective control for hoppers. In the extreme north the quantity of poison had to be doubled, since migrations began earlier and periods of feeding were reduced owing to higher ground temperatures. In 1931, over 31 tons of sodium arsenite were used in the Northern Provinces.

HUTSON (J. C.) & PINTO (M. P. D.). **Two Caterpillar Pests of Citrus.**—*Trop. Agriculturist* **83** no. 3 pp. 188–193, 2 pls., 8 refs. Peradeniya, September 1934.

Notes are given on the bionomics, distribution and control of *Phyllocnistis citrella*, Stn., and *Psorosticha* (*Tonica*) *zizyphi*, Stn., two Tineids injurious to *Citrus*, particularly young plants, in Ceylon, and all stages of both are described.

The eggs of *Phyllocnistis* are laid singly, usually on the lower surface of the leaves near the mid-rib. More than two or three eggs are seldom laid on one leaf, but sometimes every leaf on a young shoot is infested. The egg, larval and pupal stages last about 3, 5–6 and 6 days, respectively. The larva mines in the leaf and then settles down in an enlargement of its gallery at the edge of the leaf, which is gradually folded over as it spins its cocoon. The young leaves become distorted, and the typical injury appears as regular twisted galleries, the epidermis appearing silvered. On older leaves brownish patches form and serve as foci of infection by citrus canker. Occasionally, the succulent stems of young shoots are tunnelled by the larvae, especially in imported varieties of orange and grapefruit. *Phyllocnistis* is sometimes parasitised by *Eurytoma* sp. Effective control is obtained by repeated spraying with a proprietary oil emulsion containing a small proportion of nicotine (4 oz. to 4 gals. water) or with nicotine sulphate (2 oz. to 4 gals. water), both with 4 oz. soap dissolved in the water before the other ingredients are added. The addition of 4 oz. colloidal sulphur renders either of these sprays effective against most insects and fungi that attack young *Citrus*.

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The larvae of *Psorosticha zizyphi*, which are generally less injurious, web together or roll the leaves. Eggs were laid at night, after a pre-oviposition period of 3 days. The number of eggs per female ranged from 185 to 352 with an average of 300. Females fed with sweetened water lived for 3–6 weeks and males for 2–7½. Most of the eggs were laid within two weeks, but oviposition sometimes continued almost daily until within two or three days of the death of the female. The eggs were usually deposited on the leaves and hatched in 3–4 days. After feeding for 9–17 days, the larvae pupated in cocoons within the rolled leaves, the adults emerging about a week later. Continuous feeding of the larvae on the leaves stunts the plant, and if combined attacks by *Phyllocnistis* and *Psorosticha* occur, the plants are deformed and become readily infected by citrus canker or citrus mildew, and are sometimes killed. Regular application of sprays against *Phyllocnistis* should control *Psorosticha*, but if the attack persists, lead arsenate (1 oz. to 2 gals. water) should be applied two or three times at short intervals.

De Leon (D.), Bedard (W. D.) & Terrell (T. T.). **Recent Discoveries concerning the Biology of the Mountain Pine Beetle and their Effect on Control in Western White Pine Stands.**—*J. Forestry* **32** no. 4 pp. 430–436, 1 fig., 4 refs. Washington, D.C., April 1934.

Studies on the bionomics of *Dendroctonus monticolae*, Hopk. [*cf. R.A.E.*, A **22** 343] made during 1930–32 in eastern Washington and northern Idaho are summarised. Experiments in which newly infested pieces of western white pine (*Pinus monticola*) were caged at the bases of green trees of the same species showed that the adults normally produce two broods in two successive trees, but apparently do not usually infest a third tree. An average of 64 per cent. of the adults emerged from infested wood, and many that had died in the logs were probably adults that had already made their second invasion. The later the initial attack occurs, the greater will be the number of adults that overwinter in the trees they have first attacked. In one cage, when the initial invasion was made on 11th August 1931, 49 per cent. emerged 23 days later and 7 per cent. in the following spring ; in another cage, where the initial attack was made on 28th August 1932, only 18·1 per cent. emerged in the same year and 47 per cent. in the following spring. Emergence from the first tree during the same season began 7–32 days after invasion, and the peak occurred 3–20 days after the first emergence. Many of the males died in the egg galleries after the first attack, and the adults emerged in the ratio of about 2 females to 1 male, and invaded the trees at the same time as young adults, among which the sexes were equal.

An examination of 275 trees in an untreated area showed that, for the purpose of recording the seasonal history, the beetles may be divided into three classes ; 24·4 per cent. of the population overwinter in trees containing new parent adults and young larvae produced by them and by old adults that die in the tree, 25·1 in trees containing mainly young adults, and 50·5 in those containing mainly mature larvae. No tree contains a brood propagated entirely by new adults or entirely by adults infesting a tree for the second time. Further, although the sequence remains constant, climatic conditions may change the times of the events, and there are also some individual

variations that do not conform to the general seasonal history. Beetles that have overwintered as small larvae mature during June and July, and emerge and attack a tree in July (the eggs they lay there becoming small larvae in September and overwintering in that stage); after this first infestation the beetle passes its second winter as a parent adult. Overwintered parents emerge and initiate their second infestation in June. Their offspring mature during the summer and overwinter as new adults, which emerge and make their first attack in June (their progeny reaching maturity by September and overwintering in the adult stage); their second attack occurs in July. The offspring from eggs laid in July overwinter as mature larvae, passing June in the pupal stage and first attacking trees in the next July (the brood produced by this July infestation overwinters as adult larvae); their second attack occurs in August, and the resulting brood overwinters as small larvae.

Investigation and experiments have also shown that, in view of the life history of *Dendroctonus*, felling and peeling the infested trees in the spring [*cf.* **16** 92] is not an adequate control; when the bark is removed, the beetles are not destroyed, but attack green trees. Although this measure may reduce the number of trees attacked at other times it will increase the infestation in June; in two areas of trees treated annually since 1929 and examined first between 17th and 23rd June 1932, and then between 24th August and 1st September 1932, those attacked in June comprised 72·5 and 100 per cent. of the total infestations, respectively, as compared with 25 per cent. in untreated areas.

HOFFMANN (A.). **Sur les dégats occasionnés par un Scolytide sur les chênes de la forêt de Saint-Germain.**—*Bull. Soc. Sci. nat. Seine-et-Oise* (3) **2** no. 5–8 p. 93. Versailles, 1934.

The Scolytid, *Taphrorychus villifrons*, Dufour, is recorded as causing serious damage to oak in Saint-Germain in 1934, the larvae boring in the sap-wood.

MELIS (A.). **Tisanotteri italiani. Studio anatomo-morfologico e biologico del Liotripide dell'olivo** (*Liothrips oleae* **Costa**).—*Redia* **21** pp. 1–183, 46 figs., 8 pls., 110 refs. Florence, 20th November 1934.

The first part of this monograph on *Liothrips oleae*, Costa, infesting olive in Italy, deals with its morphology, classification and distribution, the second with the internal anatomy of the adult and pre-imaginal stages, and the third with biology and control. Most of the biological observations were made in the province of Lucca.

There are three generations a year [*cf. R.A.E.*, A **19** 622], the first being produced by adults that have hibernated on the olive wherever there is shelter, such as in the holes made by boring insects. Feeding occurs on fine, sunny winter days. *L. oleae* can feed on the woody parts of the tree and on the dried leaves. Pairing occurs from early April onwards, and the males then begin to disappear. It is possible that the first ovipositions are by females that have paired in autumn. Eggs are generally laid early in May, but have been seen on 20th April. There appear to be about 250 eggs per female. The egg and larval stages both last about a fortnight, the pre-pupal stage about 2 days, and the pupal stage about 6. The first generation adults begin to

appear at the end of May, at which date some of the hibernated adults are laying their last eggs, and pair 10 or 15 days after emergence. They oviposit on or near the young shoots, most of the eggs being laid at the end of June or early in July. The last adults of the second generation have appeared by mid-August, and those of the third emerge in November. The third generation, like the first, has a life-cycle of about 5 weeks, and comprises a small number of individuals. The second or summer generation completes its cycle in about 30 days, and is abundant.

L. oleae feeds exclusively on the olive, attacking the shoots, flowers and fruits, and occasionally the branches and even the trunk. The greatest injury is done from mid-July to early August, the fruits being spoiled by the injection of a salivary secretion.

Infestation is spread by the adults crawling from tree to tree, especially in July and August, and also by wind. A great increase of infestation is associated with the presence on olive of *Clinodiplosis oleisuga*, Targ., various Scolytids and *Bacillus oleae*, the injuries done by which provide the thrips with shelters for hibernation and oviposition.

Natural enemies include some spiders ; a mite, *Cheyletus* sp., and a Cecidomyid larva that suck the eggs ; *Tetrastichus gentilei*, Del G. [*loc. cit.*], which is an endophagous parasite of the larvae ; and two Anthocorid bugs, *Ectemnus reduvinus*, H.-S., and *Anthocoris nemoralis*, Fall., which destroy all the pre-imaginal stages. These and other enemies are able to control an infestation, but not rapidly enough to prevent economic loss.

Measures for control should include efforts to eliminate Scolytids and other pests with which *Liothrips* is associated, by removing infested branches, improved methods of cultivation, etc. To destroy the thrips, shoots bearing eggs and larvae should be removed in spring. Other measures include jarring the insects on to sheets, which is more effective if adhesive bands are placed on the trunk and main branches to trap those that attempt to crawl up the tree, the application of contact sprays and dusts, and tent fumigation with hydrocyanic acid gas.

Frear (D. E. H.) & Haley (D. E.). **A simplified Method for the rapid Determination of Lead Residues on Apples.**—*Bull. Pa agric. Exp. Sta.* no. 304, 8 pp., 2 figs., 8 refs. State College, Pa, March 1934. [Recd. November 1934.]

The following is the authors' summary : A rapid method for the determination of lead in spray residues on apples is presented, based on the use of the Photronic cell. Under the conditions in the tests here reported, the method has an accuracy of 0·001 grain of lead per lb. of apples, and allows lead determinations to be made with great rapidity. It is suggested that it may be useful as a field method.

Frost (S. W.). **Baits for Oriental Fruit Moth.**—*Bull. Pa agric. Exp. Sta.* no. 301, 35 pp., 10 figs., 5 pp. refs. State College, Pa, November 1933. [Recd. November 1934.]

Experiments by the author and other workers on the use of baits for *Cydia* (*Grapholitha*) *molesta*, Busck, are discussed in detail, with particular reference to Pennsylvania [*cf. R.A.E.*, A **17** 372 ; etc.]. Sufficient evidence has been accumulated to indicate that infestation of peaches may be greatly reduced by means of bait traps. The activities

of the moths and the number of broods (4–7) make the use of traps particularly suitable ; they should be put into operation in the second half of April, when the overwintering brood emerges. Except in June, catches are high throughout the summer, particularly at the peaks of emergence. White, enamelled pails appear to be the most promising type of trap. A bait of molasses (1 : 20) requires renewal every 4–5 weeks and the addition of water about once every 2–4 depending on the weather. Sodium arsenite or sodium benzoate [*cf.* **14** 447 ; **15** 260] may be added to prevent rapid fermentation during hot weather. As a result of experiments carried out in 1933, the author concludes that the numbers of *C. molesta* caught were decreased by screens of $\frac{1}{4}$ and $\frac{1}{2}$ in. mesh placed over the tops of the traps, but were increased by the use of two baffles 4 ins. high placed at right angles. Glass jars gave the highest catch but would probably require cleaning at regular intervals to give good results over 3–4 weeks. Numerous attractive substances were added to refiner's syrup (1 : 20) and nearly all of the mixtures proved superior to the standard syrup bait (1 : 20) used alone ; methyl allephenol was the most attractive but succinic acid, oleic acid and citral also gave large catches. The addition of the acids lowered the numbers of Noctuids and *Euphoria* that were attracted. Estimates of the cost are given.

WATSON (J. R.). **The Gladiolus Thrips.**—*Press Bull. Fla agric. Exp. Sta.* no. 460, 2 pp. Gainesville, Fla, March 1934. [Recd. November 1934.]

Gladiolus in many localities in Florida is attacked by the gladiolus thrips [*Taeniothrips gladioli*, Moult. & Stnw.], which was accidentally introduced in corms from the northern States [*R.A.E.*, A **21** 411]. On arrival, imported corms should be immersed for about 5 hours in a solution of 1 oz. mercury bichloride to $7\frac{1}{2}$ U.S. gals. water or for 20 mins. in water heated to 112°F. [*cf.* **21** 479] and not allowed to rise above 122°. The thrips aestivates in small numbers on plants left in the field but not on corms in store. Plants in the field should be destroyed when the corms are dug, and the field should be thoroughly clean before the next crop is planted. As the life-cycle occupies about a month in summer, the thrips may be eradicated by keeping the beds free from plants for 4–6 weeks. The damage is most severe with the advent of the hot, dry weather in March. Control measures are aimed chiefly at the adults, as they feed in more exposed situations than the larvae [**20** 420]. Sprays of Paris green and brown sugar [**21** 466] or 1·8 oz. nicotine sulphate, $\frac{1}{2}$ lb. fish-oil soap, $2\frac{1}{2}$ oz. derrisol, 8 oz. lead arsenate and 15 U.S. gals. water should be applied every 3 days, and after every heavy rain, for about 2 weeks. During cool weather in winter it might be advisable to spray less often and for a longer period.

FLINT (W. P.), DUNGAN (G. H.) & BIGGER (J. H.). **Fighting the Chinch Bug on Illinois Farms.**—*Circ. Ill. agric. Exp. Sta.* no. 419, 16 pp., 9 figs. Urbana, Ill., April 1934. [Recd. November 1934.]

An account is given of the bionomics and control of the chinch bug [*Blissus leucopterus*, Say], a serious pest of cereals in Illinois, and recommendations are included for the construction of creosote barriers [*R.A.E.*, A **14** 166, etc.], the specifications being given of two coal-tar distillates that have proved the most effective oils for this purpose.

Chu (J. T.). **Life History and Control of the Mulberry Lymantriid (*Porthesia similis* Fuess. var. *xanthocampa* Dyar) in Kiangsu.** [*In Chinese.*]—*Tech. Bull. Bur. Ent. Kiangsu Prov.* no. 9, 38 pp., 2 pls. Nanking, China, 10th December 1931. (With a Summary in English.) [Recd. November 1934.]

Arctornis chrysorrhoea (*Porthesia similis*) var. *xanthocampa*, Dyar, causes considerable damage to the leaves of mulberry in Kiangsu Province. In 1929, 3 generations appeared, coincident with those of the silkworm [*Bombyx mori*, L.], which latter frequently developed "blackspot disease" from the poisonous hairs of this Lymantriid [*cf. R.A.E.*, A **17** 567]. Many of the hibernating larvae were collected and killed in shelter bands of grass fixed round the tree trunks at the end of September and burnt in spring. Destruction of the egg-masses and cocoons and the use of light-traps were also useful.

Perkins (F. A.) & Hines (H. J.). **A Note on some preliminary Experiments with Ammonia as a Lure for the Queensland Fruit Fly (*Chaetodacus tryoni* Frogg).**—*Proc. roy. Soc. Qd* **45** p. 29, 2 refs. Brisbane, 6th June 1934. [Recd. November 1934.]

Preliminary experiments in Queensland in 1931 and further trials in 1932 indicated that the addition of any odorous substance such as vanillin to ammonia (as in the Jarvis bait [*R.A.E.*, A **20** 156]) is unnecessary for the attraction of *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.) to baits placed in glass traps in *Citrus* trees. In a test on a small scale, a modification of the standard trap, in which the flies are attracted by ammonia gas continuously liberated from solid ammonium carbonate contained in a small bottle attached to the upper opening of the trap, has been found effective. A clear solution of soap and water to drown the flies replaces the original bait.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **45** pt. 10 pp. 566–572, 7 figs. Sydney, 1st October 1934.

These notes, which belong to a series on insect pests in New South Wales [*cf. R.A.E.*, A **22** 712], deal briefly with the control, and in some cases the bionomics, of the following: *Cydia pomonella*, L., on apple; the Trypetids, *Dacus ferrugineus*, F., (*Chaetodacus tryoni*, Frogg.) and *Ceratitis capitata*, Wied., which attack the later varieties of fruits and are found chiefly in the coastal districts; *Typhlocyba froggatti*, Baker (*australis*, Frogg.), a common pest in apple orchards throughout the State; *Listroderes costirostris*, Schönh. (*obliquus*, Gyll.) (brown vegetable weevil), which overwinters on weeds and attacks most vegetables, particularly tomato and potato; *Heliothis obsoleta*, F., on tomato; and the clothes moths, *Tinea pellionella*, L., *Tineola biselliella*, Humm., and *Trichophaga tapetzella*, L.

Cottier (W.). **The Natural Enemies of the European Red-mite in New Zealand (*Paratetranychus pilosus* Can. and Fanz.).**—*N. Z. J. Sci. Tech.* **16** no. 2 pp. 68–80, 7 figs. Wellington, N.Z., September 1934.

From studies made in 1931–33, the stages and habits of four predators of *Paratetranychus pilosus*, C. & F. [*cf. R.A.E.*, A **22** 657] are briefly described. Of these, a Coccinellid, *Scymnus* sp. near *S. minutulus*,

Broun, the only predator of importance in New Zealand, is commonly found towards the end of summer on the lower surface of infested apple leaves. Both adults and larvae feed on the mites and less frequently on the eggs. The larvae have also been observed feeding on eggs of their own species. The adults deposit eggs singly on the lower surface of mite-infested leaves. On small, heavily infested apple trees, the average number of pupae per leaf was 0·5. Single larvae destroyed an average of 4 mites (both nymphs and adults) per hour ; adult beetles, unless starved, did not kill so many. One larva should be capable of consuming all the mites on two leaves, generally about 490, in less than a fortnight, but the Coccinellid appears in numbers too late in the season to provide effective control.

The larvae and cocoons of a Cecidomyid, *Arthrocnodax* sp., are found on the lower surfaces of infested leaves. The larvae, which are sluggish, are widely distributed but not at all abundant. Of a number watched at intervals for several days, only two were actually observed to attack mites, of which they sucked out the body-contents. A Gamasid mite is frequently found on infested trees in summer, and also on twigs containing winter eggs. Although it is very active, only one adult and one nymph of *Paratetranychus* were seen to be destroyed by it during the whole investigation. An active mite of the superfamily Trombidioidea, usually found on the lower surface of the leaves, was observed to attack the summer eggs and occasionally the active forms of *Paratetranychus*, but it only appeared in small numbers at the end of summer.

Isaac (P. V.). **Report of the Imperial Entomologist.**—*Sci. Rep. Inst. agric. Res. Pusa 1932–33* pp. 161–166. Delhi, 1934.

Several of the pests observed at Pusa during 1932–33 were recorded in previous reports [*R.A.E.*, A **20** 306 ; **21** 575]. *Gryllotalpa africana*, P. de B., and Elaterid larvae injured sugar-cane seedlings, and larvae of *Myllocerus discolor*, Boh., occurred in large numbers on the roots of cane. The average loss in weight at harvest at the end of January 1933 in one mosaic-free variety of cane, caused by *Scirpophaga nivella*, F., was 15·4 per cent. Samples of raw sugar sent in from Gaya were infested by *Carpophilus obsoletus*, Er., and *C. hemipterus*, L.

Miscellaneous pests included : *Pieris brassicae*, L., which caused considerable damage to cabbage ; *Athalia lugens proxima*, Klug, which was abundant on turnips and mustard and was controlled by dusting with calcium cyanide ; *Utetheisa pulchella*, L., on *Crotalaria juncea* ; *Mylabris* (*Zonabris*) *phalerata*, Pall., damaging flowers of cucurbits ; *Earias fabia*, Stoll, on *Hibiscus esculentus* and *H. abelmoschus* ; and *Sylepta derogata*, F., and *Bemisia gossypiperda*, Misra & Lamba, on cotton. Damage was caused to various fruit trees in Baluchistan by *Aspidiotus perniciosus*, Comst., *Lachnus persicae*, Cholod., *Myzus persicae*, Sulz., and *Scolytus rugulosus*, Ratz.

Hart (P. C.). **Topboorderbestrijding en parasietenfauna.** [Measures against the Tip-borer and the Parasite Fauna.]—*Arch. Suikerind. Ned.-Indië* 1934 pp. 861–916 ; *Meded. Proefst. Java Suikerind.* 1934 no. 22. Surabaya, 1934.

Following an investigation in 1931 of the parasites of *Scirpophaga intacta*, Sn., on sugar-cane in Java [*R.A.E.*, A **21** 677], further work

was done to ascertain the effect on them of artificial control. Intensive control by cutting out infested shoots and collecting egg-masses greatly reduced the numbers of all parasites, especially those that attack the eggs of the host, but as the latter is not effectively checked by parasites, such control measures should still be employed.

PAGDEN (H. T.). **Notes on Hymenopterous Parasites of Padi Pests in Malaya.**—*Sci. Ser. Dep. Agric. S.S. & F.M.S.* no. 15, 13 pp., 8 figs., 8 refs. Kuala Lumpur, 1934. Price *Cts.* 50.

Notes are given of random observations on parasites of insects attacking rice in Malaya made in the course of experimental work during 1929–32 on the utilisation of *Trichogramma japonicum*, Ashm., for the control of Lepidopterous stem borers. In previous reports [*R.A.E.*, A **18** 509, 656, 657, 658 ; **19** 139, 194, 649 ; **21** 260, 573], this parasite was erroneously recorded as *Trichogramma minutum*, Riley, or *Trichogrammatoidea* (*Trichogramma*) *nana*, Zhnt.

Parasites of *Sogata furcifera*, Horv., are the Mymarid, *Paranagrus optabilis*, Perk., first obtained in 1929 [**18** 656], which parasitised 70 per cent. of the eggs examined, the sex ratio being about 99 per cent. females ; the Trichogrammatid, *Oligosita* sp., an egg parasite that is so rare as to be unimportant ; and the Dryinids, *Pseudogonatopus hospes*, Perk., and *Haplogonatopus* sp., which attack the nymphs and occasionally the adults, but are greatly reduced in numbers by hyperparasites. Although the rate of parasitism by the Mymarid is so high that the introduction of any other egg parasite is unlikely to be successful, the life-cycles of host and parasite do not always synchronise and outbreaks of *Sogata* are consequently frequent in some localities. Both the Dryinids are parthenogenetic and oviposit immediately after emergence. The time from oviposition to adult larva is about 14 days, the host dying soon after the larva has emerged. The latter then moves about on the leaf until it finds a suitable place for the cocoon, which is usually woven on the upper surface above the mid-rib. Emergence of the adult takes place 8–17 days later. Hyperparasites bred from both species are : the Calliceratid, *Allomicrops abnormis*, Perk., as many as 5 of which have been obtained from one host cocoon ; and the Encyrtid, *Echthrogonatopus exitiosus*, Perk., and a Pteromalid, *Eupteromalus* sp., of each of which only one individual emerged from a single host.

With the exception of an unidentified pupal parasite, only egg parasites of *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) have hitherto been found in Malaya. They comprise a Pteromalid, *Eupteromalus* sp., a Mymarid, *Gonatocerus* sp., the Scelionid, *Phanurus beneficiens*, Zhnt., the Eulophid, *Tetrastichus schoenobii*, Ferrière, and *Trichogramma japonicum*. The method employed in studying these parasites is described. *Eupteromalus* sp. closely resembles *T. schoenobii* ; both appear late in the season, and the larvae are predatory in their later stages, feeding extensively on the eggs and even attacking freshly-hatched larvae [**21** 573]. *P. beneficiens* is the principal parasite of *Schoenobius*, although it is not a controlling factor because the life-cycles of host and parasite do not always coincide. This is due to the fact that rice is a seasonal crop in Malaya, so that the parasites do not have a continual food-supply and a biological balance is not obtained. It appears, however, that a certain periodicity has now been induced in the activities of the moths, so that they increase during certain months irrespective of the stage of growth of the rice. If this periodicity has

become sufficiently fixed for the moths to be unable to adapt themselves to altered conditions, a change of the planting time might entirely eliminate their attacks.

[Corbett (G. H.)]. **Division of Entomology. Annual Report for the Year 1933.**—*Gen. Ser. Dep. Agric. S.S. & F.M.S.* no. 19 pp. 38–54. Kuala Lumpur, 1934.

Many of the pests observed in Malaya during 1933 have already been noticed [*R.A.E.*, A **19** 647; **21** 676; **22** 614, etc.]. *Artona catoxantha*, Hmps., is increasing on coconut in Province Wellesley, an outbreak lasting from one year to the next having been recorded, apparently for the first time in Malaya. Adhesive bands proved ineffective: they had been very successful in another area in preventing larvae blown off the leaves by wind from reascending the palms. The control of this Zygaenid was rendered more difficult by the spread of the moths from adjacent nipa palms (*Nipa fruticans*). The Tachinid, *Chaetexorista javana*, Br. & Berg., is being collected with a view to releasing it in coconut plantations for the control of *Setora nitens*, Wlk. Other coconut pests included *Parasa lepida*, Cram., and the termites *Amitermes* (*Globitermes*) *sulphureus*, Hav., and *Coptotermes sinabangensis*, Oshima, which were reported to have attacked the collar and leaf bases of young palms.

Light-traps kept in action throughout the year showed that *Diatraea auricilia*, Dudg., *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.), and *Sesamia inferens*, Wlk., the three principal pests of rice, were most numerous during the first 4 months of the year, captures during January and February being the highest of all [*cf.* **21** 573]. There was a slight increase of *D. auricilia* in August and September and of both this species and *Schoenobius* in November. Only 12 individuals of *Sesamia* were captured throughout the year. Considerable damage was caused to rice by the Delphacids, *Sogata furcifera*, Horv., and *Nilaparvata sordescens*, Motsch.

The results of experiments in the control of *Microtermes pallidus*, Hav., which causes serious damage to lowland tea, particularly during dry spells, showed that no individual treatment with various chemical manures is very efficient, though in a small scale test badly attacked bushes treated with kainit were freed from infestation and kept free for over 6 months. Weather, soil conditions and the vigour of the bush proved to be the main factors in lessening danger of attack by termites. Pieces of dead bush and wood were almost immediately attacked when buried in a plantation where tea bushes were vigorous in spite of the presence of termites. A swarm of the Pierid, *Terias* (*Eurema*) *hecabe*, L., oviposited on *Albizzia stipulata* planted as shade for tea. The resulting larvae defoliated the *Albizzia* and then attacked and seriously damaged the tea bushes. They were effectively controlled by lead arsenate sprays. Two parasites, *Brachymeria megaspila*, Cam., and *B. euploeae*, Westw., were obtained in small numbers from the pupae.

A preliminary experiment indicated that *Pseudococcus brevipes*, Ckll., is able to transmit a "wilt" disease of pineapple. Larvae of *Phthorimaea heliopa*, Lw., the most important pest of tobacco in Malaya, refused to feed on *Solanum torvum*, egg-plant (*S. melongena*) or tomato.

Miscellaneous pests included: *Lepadoretus compressus*, Web., *Helopeltis cinchonae*, Mann., *Eriophyes carinatus*, Green, and *Ferrisiana*

(*Pseudococcus*) *virgata*, Ckll., on tea ; *L. compressus* and *Apogonia cribricollis*, Burm., on Manila hemp (*Musa textilis*) and soy-beans (*Glycine hispida*), the latter being also attacked by *Atractomorpha crenulata*, F., and *Homoeocerus serrifer*, Westw. ; *A. cribricollis* and *Alcides leeuweni*, Hell., on kapok (*Eriodendron anfractuosum*) ; *Dichomeris ianthes* Meyr., on *Indigofera endecaphylla* ; *Attacus atlas*, L., and *Metanastria hyrtaca*, Cram., on *Sandoricum indicum* ; *Rhytidodera simulans*, White, and *Cryptorrhynchus mangiferae*, F., on mango (*Mangifera indica*) ; *Araecerus fasciculatus* DeG., on *Tephrosia candida* ; *Epepeotes luscus*, F., on *Ficus* sp. ; *Margaronia marginata*, Hmpsn., on *Uncaria gambir* ; *Setora nitens*, Wlk., and *Rhynchophorus schach*, Ol., on oil palm (*Elaeis guineënsis*) that had been treated for stem rot ; *Doloessa viridis*, L., *Necrobia rufipes* DeG., and *Silvanus surinamensis*, L., on stored oil palm kernels ; *Spodoptera mauritia*, Boisd., *Parnara mathias*, F., *Melanitis leda*, L., *Anadastus scutellatus*, Crotch, *Cnaphalocrocis medinalis*, Gn., and *Gryllotalpa africana*, P. de B., on rice ; and *Tiracola plagiata*, Wlk., and *Zeuzera coffeae*, Nietn., on coffee.

Continued attempts [*cf.* **21** 571] were made in 1933 to propagate lac in Malaya, 20 lb. of brood lac produced by *Laccifer* (*Tachardia*) *lacca*, Kerr., grown on *Zizyphus jujuba* being imported for this purpose at the beginning of July 1933 from India. Two hours after arrival in Malaya, this brood lac was attached to mature rain trees, *Pithecolobium* (*Enterolobium*) *saman*, showing young shoots after pruning. Males from the first inoculation started to emerge on 19th August, about 46 days after larval emergence, and the crop from this brood was mature by 17th October, larvae continuing to emerge until 20th November. The yield was disappointing, only 160 gm. being obtained. The main cause for this was the work of parasites, one of which, provisionally identified as *Tachardiaephagus tachardiae*, How. (*Lissencyrtus troupi*, Cam.), was very abundant. As many as 8 pupae of the parasite were removed by dissection from single females of *L. lacca*. Larvae of the Noctuid, *Eublemma amabilis*, Moore, which had been present in the lac when imported, were also responsible for considerable damage, and another reason for the low yield was the falling off of leaf stems on which the larvae had settled. The larvae emerging in October–November settled well and appeared unaffected by frequent heavy rain. By December, however, many had died, though this was not the case on seedlings under cover. Some males of this brood emerged 50 days after larval swarming, or sooner than they would have done in India.

[Ul'yanishchev (V. I.).] **Ульянищев (В. И.). Experiments in Avio-Control of the Apple Moth (*Hyponomeuta malinellus* Zell.).** [*In Russian.*]—[Publ. Azerbaidzh. Pl. Prot. Sta.] pp. 8–56, 6 diagr., 3 refs. [? Baku, 1934.] (With a Summary in English.)

Experiments in aeroplane dusting against *Hyponomeuta padellus malinellus*, Zell., on apple in the north-east of Azerbaijan [*R.A.E.*, A **20** 392] were continued in 1931 and 1932. The calcium arsenate used contained 33·2–39·09 per cent. arsenic pentoxide and 1·26–3·88 per cent. arsenic trioxide and was sometimes mixed with sulphur or with sulphur and copper carbonate. The orchards were only slightly infested. In neither year was it possible to start the work before the larvae had reached their third, fourth and fifth instars. The aeroplane flew 16–26 ft. above the trees, releasing dust swaths 65–130 ft. wide. With one application, the highest mortality of the larvae (74·4–78·5 per

cent.) was obtained with a mixture of equal parts of calcium arsenate and sulphur at the rate of 15–17 lb. per acre, pure calcium arsenate (8 lb. per acre) killing 53–60 per cent. Two applications of calcium arsenate (7–8 lb. per acre) killed about 90 per cent. The mortality was invariably highest along the centre of the dust swaths. In dusting 5,500 acres, 9 lb. calcium arsenate per acre killed 65·5 per cent. of the larvae in 1931, and 10½ lb. killed 94·7 per cent. in 1932. The low mortality in 1931 was probably partly due to late application. Very uneven distribution resulted from defects in the hopper and variations in flying height. Most of the dust settled on the upper part of the crown and remained on the leaves for only about 5 days. The quantity that adhered to the lower surface was 40 per cent. less than on the upper surface. No typical scorching of the leaves occurred, but they turned colour and dropped in large numbers. Many bees and other insects pollinating the flowers were killed.

Observations showed that calcium arsenate had no marked effect on pupation or adult emergence, though both processes were somewhat retarded. The egg production of moths resulting from larvae taken in the dusted plots, however, was greatly decreased.

A spray of 1 lb. Paris green in 100 gals. Bordeaux mixture killed 73·4 per cent. of the larvae in 1931 and only 16·5–20·3 per cent. in 1932, so that aeroplane dusting appears to be at least as efficient as spraying from the ground.

In 1932, 72·2 per cent. of fifth instar larvae were killed when 28 lb. of sodium fluosilicate per acre was released from an aeroplane, and 63·1 per cent. when it was applied from the ground at half that rate. In all cases the leaves were severely scorched, but the dust was probably of inferior quality.

Ludwig (D.). **Desiccation and Survival of the Japanese Beetle (*Popillia japonica* Newman). (Abstract).**—*Anat. Rec.* **60** no. 4 & suppl. p. 44. Philadelphia, 25th November 1934.

First, second and third instar larvae, prepupae and pupae of *Popillia japonica*, Newm., were placed in vials at 25°C. [77°F.], and a study was made of the rate of desiccation, the percentage of survival, and the loss of weight of the survivors during metamorphosis. The rate of desiccation in the various stages decreased in the following order: first, second, third instar larvae, late prepupae, early prepupae, pupae. The larvae could survive desiccation until their weight was reduced by 50 per cent. This was the maximum extent of desiccation from which complete recovery was obtained. The corresponding results for early prepupae, late prepupae and pupae were 56, 66 and 70 per cent. During normal metamorphosis there is an average loss in weight accompanying the emergence of male and female beetles of 66·5 and 76·1 mg., respectively. This decrease in weight is due primarily to a loss of water. Beetles that had been desiccated as larvae, prepupae or pupae, however, lost lest water on emergence, and so contained the normal amount.

Walters (E. A.). **Control of Insect Pests.**—*Rep. agric. Dep. St Lucia 1933* pp. 15–18. Castries, 1934.

Lepidosaphes beckii, Newm., was the principal scale insect affecting *Citrus* in St. Lucia in 1933, attacking young grapefruit and orange plants, particularly such as were already sickly or waterlogged.

Control measures applied were extensive drainage, replanting young trees on mounds to enable the crown roots to drain off in wet weather, and removing scale incrustations by washing and brushing with a 2–3 per cent. dilution of "sulphemulsol" [*R.A.E.*, A **21** 220]. Mites were controlled by spraying with this material.

A decrease in growth and crop of previously healthy lime and grape fruit trees was found to be due to the larvae of an unidentified root borer, which fed extensively along the bark of the larger roots just below the surface of the ground and around the collar. The attack further results in loss of the main roots and internal infection of the phloem, and is likely to cause gumming and loss of the tree. The use of paradichlorobenzene as a soil fumigant by burying it in holes around the affected trees is recommended. Investigations in connection with losses amounting to 20 per cent. of the sugar crop caused by *Diatraea saccharalis*, F., have already been noticed [*R.A.E.*, A **22** 104]. From 1932 to 1933 field losses due to borers have increased from 18·2 to 20·3 per cent. in the average borer loss in plant canes, and from 14 to 17·4 per cent. in average joint infestation.

Cleare (L. D.) & Squire (F. A.). **The Coconut Caterpillar, *Brassolis sophorae* L. (Lep. Brassolidae) in British Guiana.**—*Agric. J. Brit. Guiana* **5** no. 3 pp. 166–199, 5 pls., 8 figs., 25 refs. Georgetown, September 1934.

Severe attacks by *Brassolis sophorae*, L., in the coastlands of British Guiana result in the loss of the coconut crop and the death of many of the palms. Information collected during many years is given on the distribution, life-history and importance of this butterfly, and all stages are fully described. The ornamental palms, *Oreodoxa oleracea* and *O. regia*, may also be seriously damaged, and infestation has occasionally been observed on banana (*Musa sapientium*) and once on sugar-cane.

The eggs are deposited in masses of varying size on different parts of the palms and occasionally on the débris beneath them. The larvae, which are gregarious, hatch in 20–25 days. They eat little for the first 12–14 days, but afterwards consume large quantities of leaf and spin several leaflets into tubular shelters, in which they construct smaller tough bags of silk. During the day they collect in large numbers in these "nests," which are usually as long as the leaflets (18–24 ins.) and may weigh as much as 2 lb.; they also hide in the heart of the palm around the bases of the leaves. During March-August the larval stage, comprising seven instars and including a pre-pupal period of 1–4 days, occupied 76–91 days. The larvae search singly for situations in which to pupate, moving actively even during the daytime, and often dropping from the palms in large numbers. They have been observed to cross trenches filled with water or climb the sides of dwellings. The pupal period, which lasts 11–14 days, may occur on the palm itself or in any place that affords suitable shelter, such as accumulations of débris below the palms. The adults become active at dusk; the numbers of the sexes seem to be equal. There are apparently 3 generations a year. The most serious attacks have been observed in the wet seasons or when the rains are prolonged or abnormally distributed. Particularly severe outbreaks seem to occur about every 5–7 years, and the caterpillars are often present in larger numbers than usual for about a year before and after these peaks. The coconut areas in the

Colony are for the most part well defined and separate, and the insect's powers of flight are feeble. Small local attacks are controlled by natural enemies, which assist also in reducing the more extensive infestations. The periodical outbreaks are due in some measure to a recurring deficiency in parasitism. Near Georgetown in 1928, 70 per cent. of the eggs were parasitised by *Anastatus reduvii*, How., and *Telenomus nigrocoxalis*, Ashm. The life-cycle of *Telenomus*, the more important of the two, lasts 14 days, and 5–6 parasites develop in a single egg of the host. In February and March 1931, 2·2 per cent. of the larvae were attacked by the Tachinid, *Winthemia* (*Chaetolyga*) *pyrrhopyga*, Wied., 1–4 individuals of which emerged from single hosts and passed about 5 days in the pupal stage. The larvae are also parasitised by a fungus (? *Metarrhizium anisopliae*). In October 1931, 34·3 and 23·4 per cent. of two lots of pupae were parasitised by *Brachymeria incerta*, Cress., and *Spilochalcis morleyi*, Ashm., of which the latter is usually the more important. From 30 to 60 individuals of *Spilochalcis* or 6–20 of *Brachymeria* are usually found in single host pupae. Several birds are important predators.

The breeding habits of *Brassolis* make clean cultivation very important. Egg-masses, larvae and pupae should be collected by hand and destroyed, or so kept as to permit the emergence of parasites for liberation. The technique of handling the material for this purpose is described. The butterflies should be collected in the evening, and predatory birds should be protected.

Weiss (A.). **Los cebos tóxicos para combatir la langosta.** [Poison Baits against Locusts.]—*Publ. Dir. Agron. Minist. Industr. Uruguay* **7** no. 3 pp. 54–64, 6 figs. Montevideo, November 1934.

Two formulae for poison baits tested against *Schistocerca paranensis*, Burm., in Uruguay, consisted, respectively, of 100 lb. coarse bran, 0·2 gals. 65 per cent. solution sodium arsenite, 0·8 gals. molasses, and 6·5 gals. water, and of 70 lb. coarse bran mixed with 35 lb. fine bran, 0·2 gals. Cooper's locusticide and 10 gals. water. Both proved very effective, and cost only about a third as much as control by means of barriers. The second formula was slightly cheaper, but the first acted more rapidly, the locusts beginning to die within 24 hours of its application.

Detailed tables of the results are given as well as instructions for the preparation and application of bait.

Melis (A.). **La mosca delle frutta** (*Ceratitis capitata* **Wied.) in Toscana. Resultati di alcuni esperimenti di lotta contro di essa.** [The Fruit-fly, *C. capitata*, in Tuscany. Results of some Control Experiments.]—*Note Fruttic.* 1935 nos. 1–3, preprint 30 pp., 1 fig., 16 refs. Pistoia, [1934] 1935.

In Tuscany, *Ceratitis capitata*, Wied., for some years, and particularly in 1933, has been especially injurious to peaches. It has three generations during the warm season, and sometimes a fourth overwintering generation that occurs as larvae in fruits maturing in November (figs, pears and late peaches), emerges as adults in the following April, and oviposits in early fruits such as apricots and some varieties of plum that ripen in May. The link might be broken if these fruits were carefully watched and if early-maturing fruits, which serve to re-initiate infestation, were not imported from warmer parts.

An account is given of laboratory and field experiments made to find a suitable mixture to render poisonous the bait of water in which bran has been steeped until fermentation begins [*cf* *R.A.E.*, A **22** 273, etc.]. The formula finally selected contained 4 parts by weight powdered quassin, 20 parts water, 200 parts alcohol 95°, and 776 parts syrup of invert sugar (acid type). When added to bran water at the rate of 1 lb. to 5 gals. and used either as a spray or in jars, it killed the flies within 3 hours and did not decrease the attractiveness of the bait to *Ceratitis* or other flies. In 1934, applications of 50 cc. per peach tree as a bait-spray were made every second day for about 40 days when peaches were ripening without harming the foliage in any way, and considerably reduced the infestation by *C. capitata*. It is thought that this spray would be equally effective on other fruit trees.

PAILLOT (A.). **Nouvelles observations sur la biologie de *Cheimatobia brumata* et sur les traitements contre ce parasite.**—*C. R. Acad. Agric. Fr.* **20** no. 26 pp. 830–834, 1 ref. Paris, 31st October 1934.

Observations on *Cheimatobia brumata*, L., in France confirmed previous ones [*R.A.E.*, A **11** 340] as to the effect of altitude, climate and weather conditions on the time of appearance of the moths. In 1933 in the Lyons region they appeared late (18th November), owing to the drought and high temperature that had prevailed during the summer. The eggs are generally laid around the young shoots, hidden in cracks of the bark or under the bud-scales. On apricot, as many as 11 eggs were counted at the base of one young shoot and 35 in a length of 5 inches. Eggs are also found, but in smaller numbers, on the larger branches. Hatching began in 1934 at the end of March and was at its height at the beginning of April.

Experiments showed that banding the trunk in autumn with lasting adhesives is of primary importance. Treatment with arsenicals (5 lb. lead or aluminium arsenate per 100 gals.) when the first leaves are opening also gave good results, although it cannot prevent the primary injury caused within the opening bud. Winter treatment with 10 per cent. tar distillate gave inadequate results, as only eggs actually moistened by the spray were killed. There was a high wind when the spray was applied, but the treatment is in any case less effective than banding the trees.

RAUCOURT (M.). **Propriétés des huiles d'anthracène employées dans la défense des cultures.**—*C. R. Acad. Agric. Fr.* **20** no. 26 pp. 834–839, 2 refs. Paris, 31st October 1934.

Tar distillates used for winter treatment of fruit-trees are classified according to their temperatures of distillation. Though in other countries the light fractions of these oils have long been in use for winter washes under the name of carbolineum, tar oils used in France contain a large percentage of the heavier fractions. The principal characters of such oils are indicated ; their physical and chemical properties correspond closely to their insecticidal action and their toxicity to plants. The principal acid components of the oil are less active than the whole oil ; and physically, efficiency seems to be related to viscosity, the inferiority observed in certain oils being mainly due to their excessive fluidity. It would appear that the heavier fractions are the most efficient, and there is a tendency, particularly in Switzerland and Germany, to

substitute products rich in anthracene oils for the old carbolineums distilling below 200°C. Pear trees experimentally treated with crude tar oil between 15th December and the end of February showed no trace of injury where the emulsion was used at 10 per cent. strength; a concentration of 20 per cent. caused slight delay in the opening of the buds, but no trace of scorching. Further tests showed that the lighter fractions are the more dangerous, injury being directly in proportion to the phenol (tar acid) content of the oils. Phenols are present in the following proportions: 20 per cent. in naphthalene oils, 15–20 per cent. in creosote oils and 2–3 per cent. in anthracene oils. An improvement in the quality of the products now employed could be effected by removing the fractions distilling below 280°C.; this would increase viscosity and diminish the risk of scorching.

DE LAPPARENT (P.). **Le derris contre les cafards.**—*Rev. Zool. agric.* **33** no. 10 pp. 145–149. Bordeaux, October 1934.

Successful attempts to control *Blatta* (*Periplaneta*) *orientalis*, L., by potato flour mixed with 10 per cent. derris carried out in 1933 and 1934 at Bordeaux are described. In the first case, the outbreak was reported in the kitchen and other rooms of a hotel in warm weather favourable to the cockroaches. The dust was applied on 25th August beneath the sink, in the drain-hole and in other likely places. Dead cockroaches were observed two days later, at the end of five days very large numbers were swept up, and in April there was still no sign of their return in any part of the hotel. Two successive applications of $1\frac{1}{4}$ lb. potato flour containing 10 per cent. derris dust killed 684 cockroaches in a bakery between 27th April and 22nd May 1934 during the unfavourable cold season. The author quotes successful results obtained with a mixture of powdered derris root and sugar by J. H. Frydlander against cockroaches but considers his own formula preferable. A good derris powder should contain at least 5 per cent. rotenone and should be protected from light.

FAES (H.), STAEHELIN (M.) & BOVEY (P.). **Les Ennemis des Plantes cultivées. Champignons parasites, Insectes nuisibles, Accidents, Moyens de Lutte.**—Cr. 8vo, 384 pp., 4 col. pls., 242 figs. Lausanne, &c., Payot & Cie, 1934.

The first part of this work includes general accounts of the types of insects injurious to plants and methods of controlling them. In the second part specific information is given on the morphology and biology of the insects and mites that attack grape-vines, fruit trees, and field and garden crops in Switzerland, and individual recommendations are given for the most practical and efficient measures for control. Brief notes on natural enemies are appended.

FRIEDERICHS (K.). **Die Kieferneule** (*Panolis flammea*) **in Mecklenburg. Nebst Bemerkungen über die Nonne** (*Liparis monacha*). [The Pine Noctuid, *P. flammea*, in Mecklenburg. With Observations on the Nun Moth, *Lymantria monacha*.]—*Forstwiss. Zbl.* **55** pp. 369–383, 457–469, 493–500, 527–540, 1 fig., 1 map, 1933. (Abstr. in *Neuheiten PflSch.* **27** no. 6 pp. 148–149. Vienna, December 1934.)

In Mecklenburg areas infested by the pine Noctuid, *Panolis flammea* Schiff., and the nun moth, *Lymantria* (*Liparis*) *monacha*, L., coincide.

Sprays containing 2 per cent. of various proprietary arsenical and contact poisons, applied by power-sprayers at the rate of about 9 gals. per acre, proved effective against wind-borne larvae of *Panolis*. The nun moth larvae were already on the May shoots of the pines at the date when the Noctuid larvae hatched and were so disturbed by the latter that they often descended from the trees. Later, when the Noctuids entered the ground to pupate, the surviving nun moth larvae fed on the apical shoots. Both species moved vertically only on the trunks, but carriage by wind also occurred. In 1932, *Pimpla instigator*, F., was a rather uncommon parasite of *L. monacha*. Parasites bred from larvae of *Panolis* were *Aphanistes armatus*, Wesm., *Exochilum circumflexum*, L., *Amblyteles rubroater*, Ratz., *Ichneumon bilunulatus*, Grav., *I. pachymerus*, Htg., *I. sarcitorius*, L., *I. nigritarius*, Grav., and *I. comitator*, L. Of other parasites of this Noctuid, the Tachinid, *Ernestia rudis*, Fall., was extraordinarily abundant, *Banchus femoralis*, Thoms., was only seen in well thinned stands, and *Microplitis decipiens*, Prell, was more common than *Anilastus rufocinctus*, Grav. The fungus, *Empusa aulicae*, completely checked the infestation in one locality. The Pentatomid, *Arma* (*Troilus*) *lurida*, F., killed many larvae of both moths. Pigs destroy large numbers of pupae of *P. flammea* and should be made use of as soon as one pupa is found per 1–2 square yards.

Gösswald (—). **Die künstliche Verbreitung der roten Waldameise *Formica rufa* L. unter besonderer Berücksichtigung ihrer Bionomie und Oekologie.** [The artificial Dissemination of the red Wood Ant, *F. rufa*, with particular Regard to its Bionomics and Ecology.] —*Forstwiss. Zbl.* **55** pp. 333–340, 1933. (Abstr. in *Neuheiten PflSch.* **27** no. 6 p. 151. Vienna, December 1934.)

Formica rufa, L. [*cf. R.A.E.*, A **23** 8] and *F. rufa* var. *rufopratensis*, Forel, cannot found colonies independently, but require adoption by *F. gagates*, Latr., a common species having many fertilised queens in a colony. Some queens of the latter species with their brood and 100–200 workers should be collected in a bag together with nest material and placed in an old, rotten tree stump free from insects or under a stone, and sexually immature groups of *F. rufa* should be introduced. Females of *F. rufa*, having been fertilised and adopted by the colony of *F. gagates*, will soon kill the queens. The brood of the new *rufa* queen will then be tended by the *gagates* workers until after some years a pure *rufa* colony results.

Meseck (G.). **Die tierischen Vorrats- und Geräteschädlinge in der Fischerei.** [Animal Pests of Fishery Stores and Gear.]—*Mitt. Ges. Vorratsschutz* **10** nos. 2, 3, 6 pp. 17–18, 29–35, 66–67. Berlin, March, May, November 1934.

This survey of pests of fresh-water fisheries in Germany includes a section on Trichoptera, particularly species of *Limnophilus* and *Anabolia*, the larvae of which cut the fibres of the threads of nets and sometimes do considerable damage.

Pax (F.). **Massenauftreten einer für Schlesien neuen Wohnungsmilbe in Friedland (Bezirk Breslau).** [An Outbreak at Friedland, District of Breslau, of a domestic Mite new to Silesia.]—*Mitt. Ges. Vorratsschutz* **10** no. 6 pp. 62–63. Berlin, November 1934.

In September 1934 *Haemolaelaps molestus*, Oudm., was recorded for the first time in German Silesia. This mite has recently become increasingly common in Germany in rural dwellings with hay lofts.

Heuell (K.). **Der Blattkäfer *Galeruca capreae* L., ein Birkenvernichter grössen Ausmasses.** [*G. capreae*, a very serious Destroyer of Birch.]—*Forstarchiv* **10** no. 1 pp. 1–3. Hanover, 1st January 1934.

In 1932 and 1933 the larvae of *Lochmaea* (*Galeruca*) *capreae*, L., appeared in numbers in the district of Treves on birch trees 5–8 years old. Many of the trees were defoliated and likely to die, and in 1933 750–1,000 acres were threatened. Particulars of the biology and economic importance of this Galerucid are given from the German literature.

Langenkamp (—). **Lärchenblattwespenfrass in Holstein.** [Injury by the Larch Sawfly in Holstein.]—*Forstarchiv* **10** no. 4 pp. 53–56, 1 fig. Hanover, 15th February 1934.

For some years *Lygaeonematus laricis*, Htg., has attacked unmixed stands of Japanese larch in Holstein [*cf. R.A.E.*, A **21** 180]. In 1933 a partial second generation was produced, though some cocoons of the first generation overwintered. Adults were observed from 1st May to 15th June and 1st July to 15th August, eggs from 10th May to 20th June and 10th July to 20th August, and larvae from 15th May to 10th August and 15th August to 25th September. Though the stages overlapped there were periods, at least during the first generation, when measures for control would affect 90–95 per cent. of the larvae. The second generation did not occur on some stands, particularly where the first had been very late. The eggs were laid only on the middle branches. Data are given for predicting the extent of future infestations.

About 250 acres of 7-year-old larch trees were dusted in June, and 96 and 98 per cent. of the larvae respectively were killed by a contact and an arsenical dust, each used at the rate of about 26 lb. per acre.

Behrndt (G.). **Einige Beobachtungen über die Bedeutung von *Formica rufa* und *Formica fusca* bei Forleulenkalamitäten.** [Some Observations on the Importance of *F. rufa* and *F. fusca* in Outbreaks of the Pine Noctuid.]—*Forstarchiv* **10** no. 18 pp. 289–294, 1 fig., 6 refs. Hanover, 15th September 1934.

Further investigations have been made in Germany on *Formica* spp. in forests infested by *Panolis flammea*, Schiff. [*cf. R.A.E.*, A **23** 8]. A nest of *F. rufa*, L., protects pines from injury by the larvae over an area of about 1,200–1,900 sq. yds. *F. fusca*, L., the value of which was demonstrated by a comparison of the number of needles in zones at varying distances from its nests, is of even greater importance in Lower Lusatia, owing to its wider distribution. Both ants should be protected.

Schwerdtfeger (F.). **Neue Untersuchungen über die Forleule. Sammelreferat.** [Recent Investigations on the Pine Noctuid. A collective Abstract.]—*Forstarchiv* **10** no. 23 pp. 377–383, 1 map, 24 refs. Hanover, 15th December 1934.

This is a survey of literature published in 1932–34 on *Panolis flammea*, Schiff., in Germany.

Eckstein (K.). **Die Kleinschmetterlinge Deutschlands.** [The Microlepidoptera of Germany.]—*Die Schmetterlinge Deutschlands* **5** pp. 1–223, 32 col. pls., 14 refs. Stuttgart, 1933.

This work on the classification, morphology and bionomics of the 1,842 German species of Microlepidoptera includes a list of those that attack cultivated plants and stored products, arranged under their food-plants, etc.

Örösi-Pál (Z.). **Bau, Entwicklung und Lebensweise des Bienenparasiten** *Acarapis woodi* **(Acarina).** [Morphology, Development and Biology of the Bee-parasite, *A. woodi*.]—*Z. Parasitenk.* **7** no. 2 pp. 233–267, 12 figs., 35 refs. Berlin, 11th December 1934.

Measurements of specimens from bees in Germany confirmed the view that *Acarapis woodi*, Rennie, and *A. woodi externus*, Morgenthaler, are not specifically distinct [*R.A.E.*, A **20** 237]. In the laboratory, the eggs of the external form of the mite hatched in 4–5 days, and the development of the larval and nymphal stages required 7–11 days.

Starke (H.). **Die Samtspinnmilbe** *Tetranychus telarius* **L. als Ursache früher Entlaubung der Linden.** [*T. telarius* as causal Agent of early Defoliation of Lime Trees.]—*Mitt. naturw. Ges. "Isis" Bautzen* **21** (1933–34) pp. 29–30, 10 refs. Bautzen, 24th July 1934.

Great numbers of *Tetranychus tiliarius*, Herm. (*telarius*, auct.) were observed in Bautzen in 1929–1932 on *Tilia platyphyllos*, covering the trees with fine webbing and feeding on the lower surface of the leaves. The infested lime trees lost their leaves 4–6 weeks earlier than did those free from attack.

[Chorbadzhiev (P.).] **Чорбаджиевъ (П.). Les insectes nuisibles aux arbres fruitiers en Bulgarie.** [*In Bulgarian.*]—Roy 8vo, vii+239 pp., 126 figs., 41 refs. Sofia, Minist. Agric., 1933. Price *Leva* 80. (With a Summary in French.) [Recd. December 1934.]

Insect pests of fruit trees in Bulgaria are responsible for an annual loss of over 30 per cent. of the crop. This book, based chiefly on observations by the author, begins with brief notes on the morphology, anatomy and metamorphosis of insects, and on their economic importance with special reference to Bulgaria. The main section (pp. 10–184) deals with the biology and control of some 125 species (grouped under their Orders) of insects attacking fruit trees. In each instance descriptions are given of the adults, and in many cases of the immature stages. Following this are tables showing the pests under their food-plants, the noxious stages, the parts of the plant they attack and the

months in which they occur, a section containing a fuller account of control measures, and indices to the Bulgarian and Latin names of the insects, and one to the parasites.

KRUGER (G.). **Cyrenaica : Plant Pests.**—*Int. Bull. Pl. Prot.* **8** no. 11 pp. M243–M244. Rome, November 1934.

Pests recorded from Cyrenaica, other than those mentioned previously [*R.A.E.*, A **22** 710, etc.], are *Mylabris* (*Zonabris*) *oleae*, Chevr., which attacks the leaves, flowers and fruit of olives and is a serious pest in the Jebel ; *Ceratitis capitata*, Wied., which has been reported for the first time from Fuehiat and the plain of Barce ; and *Retithrips aegyptiacus*, Marchal, which occurred in August in the vineyards at Tocra. *Empoasca* (*Chlorita*) *lybica*, Bergevin, has greatly increased on vines in the district of Benghazi and the plain of Barce. By the second half of July the foliage damaged by it becomes dark and falls, grapes do not ripen well, young shoots develop with short internodes and the leaves curl up.

HARRIS (W. V.). **The Sisal Weevil.**—*Ent. Circ. Tanganyika Dep. Agric.* no. 3, 2 pp. typescript. Morogoro, 11th October 1934.

The introduced weevil, *Scyphophorus acupunctatus*, Gyll., first observed in 1914 as a pest of sisal in Tanga Province, is now found in sisal plantations from the coast to Makuyuni, but not elsewhere in Tanganyika.

It can live at elevations as high as 3,000 ft., and breeds throughout the year, multiplying rapidly during the rains. Eggs are laid and develop only in very young or in senile sisal tissues, or in tissues weakened by disease. The stems of plants that have poled are the only important breeding places in respect of the number of weevils produced. The life-cycle from egg to adult is completed in about 2 months, the pupal stage occupying 10–14 days. The adults bore into the leaves of young plants or plants with weak fibres, and if a sisal heart so perforated [*R.A.E.*, A **22** 615] is infected by fungi [**22** 444], the central shoot becomes red and soft and produces conditions suitable to the development of the larvae, which die quickly in the absence of moisture. Plants over 2 years old are not generally perforated, and only leaves too small to cut are damaged. When suckers are too deeply planted, they begin to rot at the base and the weevils are attracted to them as secondary pests. The attack on healthy leaves too strong for the weevils to penetrate produces a mottled area of dead epidermis about 8 inches from the base of the leaf ; this damage is only distinguishable from that caused by friction because it is found before the leaf has unfolded.

Plants that have finished flowering are a potential source of infestation, and old stumps provide a breeding ground for at least 8 months. Consequently, the only effective control is to burn all residues on land recently cleared of old sisal before new plantings are made. When the weevils are numerous, the plants should be put in early, so that they may be well rooted before the dry season, they should not be set too deeply, and only vigorous young suckers should be used. Split stumps laid face downwards make good traps, if they are examined for weevils every second day. They must be burnt within 10 weeks of the first cutting, or they will develop into breeding places. Workers should be employed to trap and collect weevils and destroy potential breeding places at all times and particularly just before and during the rains.

Moutia (A.). **Entomological Division.**—*Rep. Dep. Agric. Mauritius 1933* pp. 25–29. Port Louis, 1934.

Lachnosterna (*Phytalus*) *smithi*, Arrow, is increasing in many localities of Mauritius [*cf. R.A.E.*, A **22** 621], though, perhaps owing to the activities of *Campsomeris* (*Elis*) *thoracica*, F., and *Tiphia parallela*, Smith, it appears to be decreasing in others. The adult beetles did not emerge until about mid-November in 1933, owing to dry weather. In laboratory tests with entomogenous fungi [**22** 421], *Metarrhizium anisopliae* and *Beauveria bassiana* infested 20 and 35 per cent. of the larvae, while in the field the percentage of infestation was 0–6 and on an average 12 (with a maximum of 28 in hot and humid conditions), respectively. No infestation was observed with *B. densa* in the field. The introduced Scoliid, *C.* (*E.*) *pilosella*, Sauss. [**21** 644] has been recovered in one locality [*cf.* **22** 621]. Great numbers of *Nomadacris septemfasciata*, Serv., caused damage to sugar-cane during January-February, but the Uba variety of cane was the only one severely attacked. Baits of bran, molasses and sodium arsenite were unsuccessful. Sexually mature adults were absent from February to the end of December. A parasite, *Wohlfahrtia euvittata*, Villen., is to be imported from South Africa. Only one male was obtained from a consignment of the Braconid, *Opius phaeostigma*, Wlkn., received from South Africa in October for use against *Dacus d'emmerezi*, Bezzi, and *D. ciliatus*, Lw., which were very injurious to cucurbits. The life-cycle of the flies occupies 18–25 days. The Pyralid, *Crambus emmerezellus*, de Joannis, continued to be a serious pest of lawns, particularly at the beginning of the summer, though it was less injurious than usual in some areas. Large numbers of the larvae were destroyed by calcium cyanide applied at the rate of 1 oz. cyanogas to 3 gals. water, followed immediately by a thorough watering or flooding. An Ichneumonid and a Tachinid were reared from the larvae in the laboratory, and the Bombyliid, *Villa unifasciata*, Macq., from the pupae. The termites responsible for damage to timber are 4 species of *Coptotermes*, 2 of *Calotermes* and 1 of *Eutermes* (*Nasutitermes*).

A survey of the more important plantations of Mauritius hemp (*Fourcroya gigantea*) indicated that *Chrysomphalus ficus*, Ashm., is widespread and injurious in some localities. In general, however, it is apparently controlled by Hymenopterous parasites, including *Comperiella bifasciata*, How., which was obtained from 5–47 per cent. of the females but is itself parasitised, sometimes to an extent of 86 per cent., by the Eulophid, *Marietta carnesi*, How. The scales may be completely checked for a time by a Coccinellid, *Rhizobius* sp. Coconuts are severely threatened by *Aspidiotus destructor*, Sign., for the control of which it is intended to import predators from Ceylon or Trinidad. *Pseudococcus brevipes*, Ckll., is common on pineapple throughout the Island. In some districts, *Cydia* (*Laspeyresia*) *molesta*, Busck, caused as many as 65 per cent. of young peaches to fall. The life-cycle occupies about 40 days during October–December. Twigs of mahogany were infested by a Pyralid and *Argyroploce* sp. The Pyralid, *Zebronia phenice*, Cram., was recorded on *Tecoma*.

Uvarov (B. P.). **Locust Problem in Africa.**—*Rep. African Affairs* **5** (1933) pp. 36–44. London, 1934.

The international organisation for anti-locust research is described [*cf. R.A.E.*, A **22** 700], and the results so far attained are summarised

[**21** 401 ; **22** 45, 701]. It is pointed out that the present outbreak in Africa is not an exceptional phenomenon, and that the continuous increase in the value of crops produced will make future invasions still more costly. To prevent future outbreaks the establishment of a permanent international organisation for the control of outbreak centres is suggested.

CURRAN (C. H.). **The Families and Genera of North American Diptera.** —Med. 8vo, 512 pp., portr., 1 col. pl., text ill. New York, J. D. Sherman, 1934. Price $7.50.

The object of this important work is not primarily the classification of Diptera but their generic identification, and the main part (pp. 21–480) is therefore occupied with keys to the families and genera of North American Diptera and brief general notes on the morphology, habitat and economic importance of each family. Many new genera are erected. In the introduction, the author briefly discusses the morphology and classification of the order, its economic importance and the collection and care of specimens. A glossary of the terms used and an index to the families and genera, showing synonymy, are appended.

COLLINS (D. L.). **Iris-pigment Migration and its Relation to Behaviour in the Codling Moth.**—*J. exp. Zool.* **69** no. 2 pp. 165–198, 5 pls., 7 refs. Philadelphia, Pa, 5th November 1934.

Investigations showed that *Cydia* (*Carpocapsa*) *pomonella*, L., is positively phototropic to a marked degree only when it has become adapted to the absence of light. All the vital activities of the moths were performed at morning and evening under changing light conditions, the eyes being adapted to the fluctuating light by the shifting of the iris-pigment. Since the reactions of the moth change according to the position of this pigment, and since the moths are originally stimulated to activity by the change in quality and intensity of light, the function of the iris-pigment, as the mediating factor between the environmental light and the light reaching the retina, conditions to a great extent the life of the organism.

MARCOVITCH (S.). **Control of Weevils in Stored Beans and Cowpeas.**—*Bull. Tenn. agric. Exp. Sta.* no. 150, 8 pp., 6 figs., 10 refs. Knoxville, Tenn., March 1934. [Recd. December 1934.]

In experiments in Tennessee various dusts were mixed in jars with beans from which adults of *Bruchus* (*Mylabris*) *obtectus*, Say, were about to emerge, and the jars were then kept at 65–90°F. for 3 months, during which period breeding entirely ceased or the beans became badly infested and finally decayed. The results show that beans may be protected by thorough mixture with hydrated lime at the rate of 1 lb. to 1 bushel seed or 1 : 65 ; those intended for seed only may be mixed with 1 oz. sodium fluosilicate to 1 bushel (1 : 1,000), or (as shown by other tests) stored in air-tight containers with 1 lb. flaked naphthalene or paradichlorobenzene to 50 cu. ft. space. Uninfested beans in closely woven sacks could be protected by a 1 in. layer of lime at the top. Damage was also prevented by the use of Anderson clay (1 : 75), copper carbonate (1 : 500) and sodium fluoride or barium fluosilicate

(1 : 1,000). Sodium fluosilicate (1 : 1,500) was satisfactory against *Calandra* (*Sitophilus*) *granaria*, L., and apparently against *Sitotroga cerealella*, Ol., in grain.

Baldwin (W. H.). *Antestia* **Control.**—*E. Afr. Standard* no. 2398 p. 40. Nairobi, 27th October 1934.

From experience in the control of *Antestia* on coffee in Tanganyika, the author discusses results recorded in Kenya by LePelley [*R.A.E.*, A **21** 265], and questions the efficiency of pyrethrum-kerosene sprays, since rapid multiplication is liable to result from the surviving bugs and it is doubtful whether the eggs are killed. He states that a high mortality is now obtained in Tanganyika by three applications at intervals of 7 days of a triple strength bait-spray [*cf.* **16** 76] consisting of 60 gm. [2·1 oz.] sodium arsenite, 5 lb. jaggery and 4 gals. water, applied by an atomiser at the rate of 1½ oz. per tree. The applications are only effective if a minimum of alternative food (ripening coffee berries) is available. Rain does not affect the results obtained if the bait remains on the trees for 48 hours.

Scorching by bait sprays is stated to be due to faulty application, and to be equally possible with pyrethrum-kerosene. Practical experience during 1931–34 has shown that infestation by the leaf miner [*Leucoptera coffeella*, Guér.], which has been said to increase where bait-sprays have been applied owing to destruction of parasites [*cf.* **20** 117, 546], actually decreased in areas receiving bait-spray, whereas on neighbouring untreated plantations it remained severe. Fluctuations in the occurrence of *L. coffeella*, however, require further study.

The author states that in Tanganyika satisfactory results have been obtained by this spray at a cost commensurate with the present market price of coffee, while he estimates that pyrethrum-kerosene sprays would cost five times as much as the bait-spray.

Haines (G. C.). **The small House Ant.**—*Fmg in S. Africa* **1934** reprint no. 77, 1 p. Pretoria, October 1934.

A brief account is given of the habits and control of *Pheidole megacephala*, F., which periodically swarms in houses in various parts of South Africa, particularly in the Transvaal. Boiling water, carbon bisulphide or petrol poured directly into the nest will destroy it, but few nests are accessible to such treatment. Pyrethrum powder or an atomised kerosene-pyrethrum spray may be applied to ants swarming on the floors, but the effect is not lasting. Fatty baits poisoned with small quantities of white arsenic, lead arsenate or Paris green will slowly exterminate a colony of ants, and bait traps in the form of bones or sponges soaked in sugar and water may be put down to attract them, the bones being then burnt and the sponges soaked in boiling water. The ants may be repelled by creosote mixed with an equal quantity of kerosene and applied with an atomiser ; with crude carbolic acid alone or diluted with water applied in the same manner ; or with naphthalene flakes spread thinly on the floor. The best insecticide for general use is sodium fluoride powder, which should be spread thinly wherever ants abound, especially at cracks or corners from which they are likely to emerge.

Jepson (F. P.). **Report on the Work of the Division of Plant Pest Control.**—*Adm. Rep. Dir. Agric. Ceylon 1933* pp. D 106–123. Colombo, 1934.

An account is given of the success of regulations and control measures against proclaimed pests of tea, coconut and banana in Ceylon during 1933. The pests include *Xyleborus fornicatus*, Eichh., which was discovered on pruned tea and seed-bearers in the centre of an extensive area previously considered to be free; *Homona coffearia*, Nietn. (tea tortrix), which appeared to be less destructive in districts where it had been a serious pest, but increasingly injurious elsewhere; nettle grubs (Limacodids), outbreaks of which on tea occurred chiefly in the dry season and were more numerous than in the previous year, though the total area affected was less; and *Oryctes rhinoceros*, L., *Rhynchophorus ferrugineus*, F., and *Nephantis serinopa*, Meyr., on coconuts. Bananas infected with bunchy-top disease by *Pentalonia nigronervosa*, Coq. [*R.A.E.*, A **19** 62] should be cut down and the remaining few inches destroyed by treatment with about 2 pints of a special oil obtainable locally; care should be taken that material for planting should be derived only from uninfected sources.

Special investigations were concerned mainly with termites. *Calotermes* (*Neotermes*) *militaris*, Desn., *C.* (*N.*) *greeni*, Desn., *C.* (*Glyptotermes*) *dilatatus*, Bugnion & Popoff, and *Coptotermes ceylonicus*, Holmgr., were recorded on several occasions as injuring tea, each of the last three being obtained from new localities. *Calotermes greeni*, which is widespread in the Island, also attacks *Grevillea robusta*. *Coptotermes ceylonicus* infested cacao for the first time and caused extensive damage to *G. robusta* on a tea estate. This termite, which is one of the most destructive, attacks living plants through their root systems from subterranean nests and is also chiefly responsible for damage to woodwork in buildings. *Termes* (*Cyclotermes*) *redemanni*, Wasm., which is usually considered a scavenger, apparently caused direct injury to *Crotalaria brownei*. About one-half of a crop of *Coix lachryma-jobi* five months old was destroyed by *T. horni*, Wasm. Infestation of bungalow woodwork by dry-wood termites had previously been considered to be restricted to areas below 3,500 ft., but during the year cases were recorded from altitudes of up to 5,700 ft. *Eutermes* sp. caused extensive damage to a bungalow, this type of termite injury being rare. In tests of building materials, the Burmese timber, *Hopea odorata*, was found to be resistant to infestation by *Calotermes* (*Cryptotermes*) sp., *Termes* (*Hypotermes*) *obscuriceps*, Wasm., *T. horni* and *T. redemanni*, samples remaining in an active nest of the last species for 26 months. On one estate that is seriously attacked by *Calotermes militaris*, *Albizzia* interplanted with the tea is also severely infested, and even dadap [*Erythrina*] and *Crotalaria* are attacked. *C. dilatatus* has been satisfactorily controlled on tea by means of Paris green, though not so readily as *C. militaris* [*cf.* **21** 362], since a single bush may harbour several distinct and unconnected colonies in the branches and more than one injection is therefore necessary. The central nests of mound-building termites may be completely destroyed at a reasonable cost by petrol [**19** 336].

Laboratory tests indicated that a mixture of less than 1 oz. mercury bichloride and 1 pint rectified spirits is not effective in preventing injury to books by cockroaches and that this solution is costly and is almost

as dangerous for use as ammonium arsenite [**21** 36], which, although it was the more effective, was discarded on this account. An alcoholic extract of *Derris elliptica* was the least toxic.

HUTSON (J. C.). **Report on the Work of the Entomological Division.**— *Adm. Rep. Dir. Agric. Ceylon 1933* pp. D 134–140. Colombo, 1934.

Insect pests occurring in Ceylon in 1933 other than those recorded in the previous year [*R.A.E.*, A **21** 361] included : *Toxoptera aurantii*, Boy., which was unusually injurious to tea in June after wet weather in May ; *Parasa lepida*, Cram., and the Satyrid, *Elymnias fraterna*, Butl., which attacked coconut leaves in July ; *Pachydiplosis oryzae*, Cram., which was unusually prevalent during the second quarter, *Schoenobius bipunctifer*, Wlk., *Hieroglyphus banian*, F., an outbreak of which occurred in January, and the Delphacids, *Sogata furcifera*, Horv. (*pallescens*, Dist.) and *Niloparvata lugens*, Stål (*greeni*, Dist.), all on rice ; *Helopeltis antonii*, Sign., which attacked cacao, and Bostrychids and Scolytids infesting plants of this crop affected with stem diseases, which were unusually prevalent during the wet weather ; a Sphingid, *Acherontia* sp., on the leaves, and *Dacus caudatus*, F., in the fruit, of tomato ; *D. cucurbitae*, Coq., which was recorded from the fruit of *Luffa acutangula* and pumpkin (*Cucurbita maxima*) ; *Acherontia lachesis*, F., on Jerusalem artichoke (*Helianthus tuberosus*) : the Noctuid, *Parallelia palumba*, Gn., on grapefruit ; *Pulvinaria psidii*, Mask., on sweet and mandarin oranges ; the Noctuids, *Stictoptera grisea*, Moore, and *S. cucullioides*, Gn., which ate the leaves of mangosteen (*Garcinia mangostana*) ; *Ceroplastes ceriferus*, And., on the leaves of pomegranate (*Punica granatum*) ; the Lygaeid, *Graptostethus servus*, F., on *Crotolaria juncea* ; and the Lamiid, *Coelosterna scabrator*, F., and the Buprestid, *Psiloptera cupreosplendens*, Saund., injuring young *Casuarina* in forest plantations.

The results are given of investigations on *Phthorimaea heliopa*, Lw., on tobacco [**22** 624], *Phyllocnistis citrella*, Stn., and *Psorosticha zizyphi*, Stn., on *Citrus* [**23** 49], and two weevils [**22** 683] and the Capsid, *Disphinctus humeralis*, Wlk., on mango. Young leaves attacked by the Capsid, the nymphal stage of which is the most destructive, turn brown and shrivel. It feeds on a great variety of wild and cultivated plants and is widely distributed throughout the Island. The eggs are laid singly in the leaf-stalks and other tender portions of the shoots. In captivity, the egg stage lasted about 10–12 days and the nymphal stage about 12–14. Regular spraying with an oil emulsion containing nicotine is effective in control.

A consignment of lac insects [*Laccifer lacca*, Kerr] that arrived at the end of January became fairly well established on *Zizyphus jujuba*, but partly owing to unfavourable weather, only produced a moderate brood, which swarmed during a very wet period, so that most of the young larvae were destroyed. Pests of *Z. jujuba* included the Limacodid, *Natada nararia*, Moore, the Geometrid, *Petelia* (*Dilinia*) *medardaria*, H.-S., the Tortricids, *Homona coffearia*, Nietn., and *Adoxophyes privatana*, Wlk., the Lymantriids, *Euproctis* (*Nygmia*) *flava*, Brem., and *E.* (*N.*) *scintillans*, Wlk., and the weevils, *Myllocerus curvicornis*, F., and *Astycus immunis*, Wlk. Young plants of *Grevillea* were attacked by *Anurogryllus* sp. and *Gymnogryllus humeralis*, Wlk. During the second quarter the latter was unusually prevalent on grass

land in two areas and investigations on its control were begun. Where the crickets are not too numerous, they may be brought to the surface by treating the burrows with soap and water, or they may be destroyed by soil fumigation with petrol. Only one individual was obtained from a burrow. As they remove blades of grass to their burrows, the application of an arsenical to the grass may prove an effective control.

Comisión Central de Investigaciones sobre la Langosta. Informes de las Comisiones Exploradoras. Mayo a Agosto de 1933. [Central Commission of Investigations on Locusts. Reports of the Exploring Commissions, May-August 1933.]—207 pp., maps, illus. Buenos Aires, Minist. Agric. Argent., 1934.

Nine exploring commissions were sent out by the Central Commission of Locust Investigations in Argentina in the winter of 1933 to investigate the supposed "winter refuges" of *Schistocerca paranensis*, Burm., in that country. Their reports are preceded by a general report of the Central Commission (pp. 5–47), outlining the organisation of the investigations and stressing the distinction between the "winter refuges" and the outbreak areas.

In the Report of the First Commission (pp. 49–66), P. C. L. Denier concludes that in the regions to the east of Jujuy in the extreme north of Argentina there are no "winter refuges" and that the isolated locusts observed were stragglers from migrating swarms. The areas examined are divided into the subtropical forest zone, where hibernating locusts were found only in the clearings near the forests; the "patagónico jujeño" zone, with xerophilous vegetation on a stony soil, where owing to excessive night dews the conditions are unsuitable for breeding, but where eggs can occasionally be laid; and the Andean zone, with very poor dry pastures where passing swarms may occur, but where they cannot breed or hibernate, owing to frosts, high humidity and winds. The locusts observed in winter were inactive, with undeveloped reproductive organs. Of parasites, only mites (*Eutrombidium*?) were found in small numbers; some dead locusts were infested by a fungus (probably *Sporotrichum*). The need of continuous observations is urged, and a list of other Acridids found in different localities in included.

In the second Report (pp. 67–97), P. Köhler gives an account of work in Salta and Formosa (north-eastern Argentina). He concludes that there is one generation a year, which breeds in spring in the south. The immature locusts migrate northwards, but return south again in spring without having bred. Throughout the year, the migration routes depend on the positions of high and low pressure areas. There are no "winter refuges," but only a variable zone where swarms hibernate, limited by the position of the low pressure area in which they move, and by an isotherm of 15–20°C. [59–68°F.]; it comprises the northern dry semi-desert areas and seldom extends beyond the upper Pilcomayo. Large swarms of hibernating locusts are killed by the fungus, *Sporotrichum paranense* [*cf. R.A.E.*, A **22** 351]. Apart from migrating swarms, there exist local ones leading a semi-sedentary life, and scattered stragglers from migrating swarms, which are found in some isolated valleys with abundant grass vegetation and differ from the swarming locusts in coloration and behaviour. These probably mature earlier than the swarming ones, and their progeny migrate southwards at a period much later than the normal. A comparison of

times of migrations suggests that the locusts of Argentina differ in this respect from those of other countries in South and Central America, and that the problem is a purely local one. It is suggested that hibernating swarms should be controlled by motor-car parties, with sprayers in open country and with flame-throwers in less accessible areas. In inaccessible and uninhabited land, aeroplanes should be used for scouting and for applying sodium arsenite dust to the locusts while they are in flight, since the moving swarms are easily seen from the air. Rainfall, pressure and wind maps are appended.

In the third Report (pp. 99–136), J. B. Daguerre presents a brief diary of the expedition, with notes on the occurrence of locusts in the centre and south of Salta and on the confines of the Chaco. After breeding in the southern cultivated areas, the swarms concentrate and move towards the north, where they hibernate in the dry mountain region. There are no special " winter refuges," and no evidence of the solitary phase in the Argentine locust. A detailed description and classification of the vegetation of the region by J. R. Bortagaray is included.

In the fourth Report (pp. 137–153), R. Maldonado Bruzzone describes the expedition to southern Salta and northern Santiago Estera. All the explored regions, but particularly some valleys and the Chaco, where numerous dispersed locusts were found, proved suited to hibernation. Meteorological data for the region are given, and the vegetation is described.

In the fifth Report (pp. 155–160), J. Bonini describes the expedition to northern Córdoba. No hibernating swarms were observed.

In the sixth Report (pp. 161–169), T. L. Marini discusses the expedition to south-western Santiago Estero, north-eastern Córdoba and north-western Santa Fé. Locust swarms were found in all the areas explored. They migrate northward with the beginning of the cold weather, but stop on encountering suitable conditions, as in Santiago Estero.

In the seventh Report (pp. 171–179), J. M. Bosq describes the expedition to central Santiago Estero and Tucumán. Hibernation of swarms is only possible in the scrub-covered northern parts of the area surveyed, where the winters are milder than elsewhere.

In the eighth Report (pp. 181–204), K. J. Hayward gives an account of the work in Rioja, where only migrating swarms and some scattered locusts were found. The direction of flight is normally against light winds, but becomes diagonal to, and finally coincides with, the wind as the strength of the latter increases. Natural enemies included Sphegids, *Sarcophaga* sp. and *Trox* spp.

In the ninth Report (pp. 205–207), M. P. Gomez gives the itinerary of his expedition in Catamarca and records of swarms observed there.

Comisión nacional de Defensa contra la Langosta. Lucha nacional contra la Langosta. Contribución científica de la Sociedad Entomólogica Argentina. [National Commission of Defense against Locusts. National Control of Locusts. Scientific Contribution by the Argentine Entomological Society].—135 pp., maps, illus. Buenos Aires, Minist. Agric. Argent., 1934.

This publication contains the papers presented at special meetings of the Argentine Entomological Society held on 22nd December 1933 and 13th January 1934 to discuss the locust problem.

In La lucha contra la langosta (pp. 13–25), F. Lahille points out that from 1875 to the present day a focus of locust infestation has existed in the central agricultural regions of Argentina, and stresses the need for united international action on the basis of the resolutions adopted by the Second International Locust Conference in Paris [*R.A.E.*, A **21** 51] and for field study of the life-cycle of locusts by resident experts. Tables of infested areas and of yearly expenditure on locust control from 1897 to 1933 are included, and the author, in noticing the ineffectiveness of the existing organisation, recommends the establishment of a permanent anti-locust organisation.

In Organización de los estudios Acrídicos en el Mundo (pp. 27–40), J. Liebermann gives an account of anti-locust research in countries outside South America, and, taking the International Centre for Anti-Locust Research [*cf.* **22** 700] as a model, puts forward a number of suggestions for organising and centralising such research in South America.

In La lucha biológica (pp. 41–44), E. E. Blanchard discusses the possible value of biological control of locusts.

In Los hongos parásitos de la langosta en la República Argentina (pp. 45–53), J. B. Marchionatto records investigations on the fungus, *Sporotrichum paranense* [*cf.* **22** 351, 700], which causes great natural epidemics in Argentina, particularly in forested areas with a high temperature and humidity. The symptoms of infested locusts are described ; the fungus is pathogenic for both hoppers and adults, but not for other species of Acridids.

In Acerca de la utilización del microbio de d'Herelle (*Coccobacillus acridiorum*) en la lucha contra la langosta del país (pp. 55–60), S. S. Quiroga gives a brief history, including an account of experiments arranged in 1933 by a special commission under J. B. Marchionatto, of the application of *Coccobacillus* to locust control. *C. acridiorum* can be found in the intestine of the Argentine locust in all stages, and the virulence of the cultures can be raised by successive inoculations, but it is impossible to obtain a culture that would be effective when applied *per os*.

In Los refugios invernales (pp. 61–90), C. A. Lizer y Trellis gives a historical review of the problem of the supposed " winter refuges," which, as has been finally shown by the field expeditions of 1933, are non-existent. The habitat and habits of South American locusts remain largely unknown.

Abbreviated reports of the Exploratory Commissions nos. 1, 2, 3, 4, and 7 [see preceding paper] are also given.

Newman (L. J.). **The Mediterranean Fruit Fly** (*Ceratitis capitata*).—*J. Dep. Agric. W. Aust.* (2) **11** no. 3 pp. 427–433, illus. Perth, W.A., September 1934.

A brief account is given of the biology and control of *Ceratitis capitata*, Wied., which was exceptionally numerous and widespread in Western Australia in 1934, when the humidity was high in the summer and early, heavy rains occurred in the autumn. The stages are briefly described. The rains apparently predisposed to attack fruits that are usually considered unsuitable for breeding. Large numbers of adults survived the winter, despite wet conditions, but it is improbable that larvae overwinter in more than 1 per cent. of the winter and spring fruits of *Citrus* and loquats. It is of great importance to undertake control measures at this period.

Newman (L. J.). **The Green Tomato Bug Egg Parasite** (*Microphanurus megacephalus*).—*J. Dep. Agric. W. Aust.* (2) **11** no. 3 p. 434, 4 figs. Perth, W.A., September 1934.

Evidence has been obtained that *Microphanurus megacephalus*, Ashm., which was introduced into Western Australia from Egypt [*R.A.E.*, A **22** 446] for the control of the green tomato bug [*Nezara viridula*, L.], has reproduced in the field.

Meyrick (E.). **Notes on New Zealand Lepidoptera.**—*Trans. roy. Soc. N.Z.* **64** pt. 2 pp. 151–153. Dunedin, N.Z., September 1934.

The species recorded include *Hellula undalis*, F., a single adult of which was collected about 3 miles inland on the west coast of South Island on 31st August 1932. This Pyralid has not been recorded previously from New Zealand, but is common on cabbage and turnip in many countries, including Australia and some of the Pacific islands. It is probable that it is sometimes accidentally imported by man, but also migrates freely.

Chamberlain (E. E.). **A Virus Disease of Strawberries in New Zealand.** —*N.Z. J. Agric.* **49** no. 4 pp. 226–231, 3 figs., 10 refs. Wellington, N.Z., 20th October 1934.

Among the causes of degeneration of the strawberry in New Zealand is a virus disease similar to xanthosis or yellow edge [*R.A.E.*, A **21** 296] that causes yellowing and bunching of the young leaves, premature falling of the older ones, development of small flower trusses and formation of poor fruit. Diseased plants do not recover. In 1931–32, healthy runners exposed to 50–100 individuals of the Aphid, *Capitophorus potentillae*, Wlk. (*fragariae*, Theo.) bred on infected plants were fumigated after about 2 and again after a further 6 weeks and showed symptoms of the disease after 4 months. In 1934, when runners were exposed to 20 individuals and fumigated after 4 weeks, symptoms were observed at the end of 3 months.

[Sakharov (N.), Pilyugina (O.) & Ginsburg (D.).] **Сахаров (Н.), Пилюгина (О.) и Гинсбург (Д.). The Weevils of the Genus** *Sitona* **attacking leguminous Plants and their Control.** [*In Russian.*]—*Grain Prod. J.* **4** no. 3 pp. 75–83, 16 figs., 17 refs. Saratov, 1934. (With a Summary in German.)

In 1930 a study was made of the weevils of the genus *Sitona* infesting lentils in the Lower Volga region. *S. crinita*, Hbst., all stages of which are described, was the predominant species. A detailed account is given of its biology, which is similar to that of *S. lineata*, L., in the Ukraine [*R.A.E.*, A **17** 434]. There is one generation a year ; the egg stage lasts 8–10 days, the larval 21–32, and the pupal 8–14. The young adults emerge at the end of July and chiefly occur on lucerne, as it continues to produce fresh green shoots till late in autumn. They are sluggish and, without pairing or ovipositing, enter hibernation under fallen leaves and small lumps of earth, or in the cracks and upper layer of the soil. They emerge in late April or early May and live for 1–10 weeks. At first they infest lucerne, but migrate to lentils as soon as the latter begin to sprout. Pairing takes place soon after emergence and supplementary feeding on young wild and cultivated leguminous

plants. The oviposition period is very protracted and may last, in favourable weather, till the end of July. The total number of eggs laid by a female in the insectary varied from 30 to 860, with a maximum of 26–27 a day. In the field, the eggs never occurred on plants, but usually in depressions and cracks of the soil. The larvae feed on the root-nodules of leguminous plants and are most numerous at a depth of about 4 ins. They could be found from the end of May to the end of July. Pupation takes place in small earthen chambers at a depth of about 2–3 ins. In the laboratory, the adults were killed by an unidentified fungus [*cf.* **17** 435].

The damage caused is discussed. The root-nodules attacked by the larvae lose their value as nitrogen-collecting organs [**17** 434]. The adults kill young sprouting plants by destroying the growing point, and laboratory experiments showed that the injury they cause to the leaves of lentils may reduce the crop by 65 per cent.

The results of control experiments in the field and laboratory are shown in tables. Dusting with calcium arsenate or sodium fluosilicate at the rate of 9 -12½ lb. and 12½ -14½ lb. per acre, respectively, proved to be the most effective measure. In field experiments in 1930 and 1932, calcium arsenate killed 65 and 41·4 per cent. of the weevils and sodium fluosilicate 52 and 68·6 per cent. ; in the laboratory, sodium fluosilicate killed 92·5 per cent. in 5 days, and calcium arsenate 72·5 per cent. Sodium fluoride, though very effective, caused severe scorching of the leaves.

Other species found, though in negligible numbers, were *S. punctipennis*, Steph., and *S. lineata*, against which the same control measures would probably be efficient.

[Megalov (A. A.).] **Мегалов (A. A.). New Pests of graminaceous Plants—Bugs (*Anapus freyi*, Fieb., and *Orthocephalus brevis*, Fieb.).** [*In Russian.*]—*Grain Prod. J.* **4** no. 3 pp. 83–85. Saratov, 1934.

Serious damage to large areas of wheat by the Capsids, *Orthocephalus brevis*, Panz., and *Anapus freyi*, Fieb., has been recorded from the Lower Volga region. Observations carried out in 1925–26 by the Saratov Plant Protection Station on *O. brevis* and in 1929–30 by A. A. Shamaev on *A. freyi* showed that their bionomics are very similar ; infested plants wither, yield less grain, and are easily killed by drought. *A. freyi* hibernates in the egg stage inside the stems of *Agropyrum* spp. and *Festuca sulcata*. A female lays 24–36 eggs in batches of 12–28, two or three of which are often found in a plant at a height of 2–6 ins. Plants with solid stems, and especially *A. ramosum*, are preferred for oviposition. Upon hatching, the young nymphs make their way to the surface of the stems and feed on the green parts of the plants. In 1930 *Anapus* was first observed in April, and in 1926 and 1929 nymphs of both species were abundant in the second half of May. The nymphal stage lasts 25–32 days. Adults, which live 10–18 days, began to appear in mid-May and became abundant about 10th June. Pairing and oviposition occur soon after the adult stage is reached, but there is only one generation a year. The chief food-plants are *Agropyrum ramosum*, *A. repens* and *Poa* spp. As these grasses dry up, the Capsids migrate to wheat, which is then usually at the tillering stage (in 1926 in the first half of June). Wheat, however, serves only as an intermediate food-plant.

In the years following experiments in the autumn of 1926 and 1930 in burning the steppe vegetation to destroy the hibernating eggs, no Capsids were found in the treated plots. Since the legs of *O. brevis* are very easily broken, the author conducted small-scale experiments in destroying it by dragging brooms or a sort of brush-harrow across infested plots of land adjoining the wheat fields, and obtained satisfactory results.

[Megalov (A. A.).] **Мегалов (A. A.). Measures to reduce the noxious Activity of the Sunflower Lamiids** (*Agapanthia*). [*In Russian.*]—*Grain Prod. J.* **4** no. 3 pp. 86–88. Saratov, 1934.

Since 1932, the Lamiids, *Agapanthia dahli*, Richt., and *A. cynarae*, Germ. [*R.A.E.*, A **19** 6; **22** 588] have increased in numbers on sunflowers in eastern Ukraine, the North Caucasus and the Lower Volga region, 12–90 per cent. of the plants being infested. In 1934, sunflowers in the Saratov region were rather severely damaged, 5 per cent. of the stems having been broken by 20th June. Tests in the autumn of 1932 showed that about 60 per cent. of the larvae are killed if the roots and stubble are ploughed in to a depth of 10 ins. In experiments in the autumn of 1933, when the stubble was ploughed in to a depth of 6–7 ins., the number of larvae surviving in the following spring was lowest in plots in which the plants had been cut at soil level, three and four times as many, respectively, surviving when the plants were cut 4 and 8 ins. above the ground.

[Megalov (A. A.).] **Мегалов (A. A.). The Mechanical Method of controlling Grain Mites under the Conditions of Elevators and mechanised Granaries.** [*In Russian.*]—*Grain Prod. J.* **4** no. 5 pp. 96–101, 1 graph. Saratov, 1934.

In the Russian Union enormous losses are caused annually owing to infestation of stored grain by mites, of which *Tyroglyphus* (*Aleurobius*) *farinae*, DeG., *T. dimidiatus*, Herm. (*longior*, Gerv.), *T. siro*, L., and *Glycyphagus cadaverum*, Schr., are the most important. Very favourable conditions for them are afforded by the storage of large amounts of grain that is too moist and in which a high temperature is easily developed. The granaries should be kept dry and free from heaps of sweepings and débris, and prior to the storage of the grain should be washed with solutions that would kill the mites.

Since most granaries in Russia are unsuited to fumigation, the author suggests a method of control based on his observations that mites are easily killed by the weight of falling grain. In experiments with considerable quantities of infested rye, five wooden shields were fixed in the funnel that conducts the grain from a chamber above into the magazine at the bottom of the elevator. They were inclined alternately one to another at an angle of 45 degrees and were so placed that the grain, after passing through the space of about 14 ins. between their edge and the side of the funnel fell upon each successive shield from a height of about 3 ft. When the rye was passed over the shields 69 per cent. of the mites were killed, or 84 per cent. when the process was carried out twice. A higher mortality could probably be obtained by increasing the number of the shields. The grain was apparently not damaged.

Morison (G. D.). **Advisory Entomology, 1933–34.**—*Rep. N. Scotland Coll. Agric. 1933–34* pp. 21–23. Aberdeen, 1934.

Local damage to potatoes in Scotland was caused by the larvae of *Serica brunnea*, L., and of *Gortyna micacea*, Esp., the latter tunnelling in the stems. The importance of *Byturus tomentosus*, F., on raspberry seems to be increasing. A mixture of ortho- and para-dichlorobenzene and sand gave promising results as a repellent against the cabbage root-fly [*Phorbia brassicae*, Bch.] and the turnip flea-beetle [*Phyllotreta nemorum*, L.]. During the year 210 samples of bees attacked by acarine disease were received; the mites [*Acarapis woodi*, Rennie] may be killed in 10 days by treatment with Frow's mixture [*R.A.E.*, A **20** 63].

Lal (K. B.). *Psyllia peregrina* **Först., the Hawthorn Race of the Apple Sucker,** *P. mali* **Schmidb.**—*Ann. appl. Biol.* **21** no. 4 pp. 641–648, 9 refs. Cambridge, November 1934.

An account is given of the observations in Scotland that led the author to conclude that *Psylla* (*Psyllia*) *peregrina*, Först., is a race, confined to hawthorn, of *P.* (*P.*) *mali*, Schm. [*R.A.E.*, A **22** 602].

The life-history of the forms occurring on hawthorn [*loc. cit.*] does not differ materially from that of *P. mali* (apple sucker) in England. The adults are morphologically identical except that the apple form is slightly larger and stouter, particularly in early summer; but even this difference is not constant. There are, however, slight differences in the nymphs, providing an instance of poecilogony [*cf.* **10** 354]. Yet the hawthorn and the apple forms do not mate with each other, and do not oviposit on each other's food-plants. The nymphs of either, when transferred to the other's food-plants, do not survive for long.

The author, however, considers that, in Psyllids at least, differences in biology, food-plants and even immature stages, can serve only as confirmatory evidence in the differentiation of species, the identity of which must be primarily based on fixed peculiarities of adult morphology.

Worsley (R. R. LeG.). **The insecticidal Properties of some East African Plants. I.**—*Ann. appl. Biol.* **21** no. 4 pp. 649–669, 6 refs. Cambridge, November 1934.

An account is given of tests in Tanganyika Territory to determine the insecticidal value of a number of East African plants. The standard method for obtaining alcoholic extracts was the following: The plant material was dried at 100°C. [212°F.] in an air oven, or at 50°C. [122°F.] in a vacuum oven, a loss of the poisonous principle being suspected at higher temperatures. The dried and finely ground material was at once added to absolute alcohol (1 gm. to 9 cc.) in the cold. The mixture was shaken, left for 24 hours with occasional shaking, filtered and washed through with sufficient alcohol to bring the volume up to 10 cc. per gm. This is termed a 10 per cent. extract, and when diluted with water to 10 times its volume a 1 per cent. extract. The insecticide was applied during 4 secs. from a distance of 18 ins. by a hand-spray working at 30 lb. pressure. In tests against Aphids, a leaf with a known number of Aphids on one surface was pinned in a vertical position and sprayed with the nozzle horizontal. After the excess liquid had drained off, the leaf was placed vertically in a glass dish

for observation. Lepidopterous larvae were placed on a filter paper inclined at an angle, and the sprayer nozzle was held at right angles to it. The sprayed larvae were placed on dry filter paper and put aside for observation. A 0·5 per cent. solution of nicotine as sulphate (made up from a commercial 40 per cent. nicotine sulphate) was used throughout as the standard of comparison. Both 1 per cent. saponin and ½ per cent. soft soap solutions were used as spreaders.

Cassia didymobotrya and *Barringtonia racemosa* had toxic properties slightly less than half that of the nicotine sulphate. These plants might be of value for use as insecticides where they grow wild, but would not be worth cultivating. No definite chemical compounds were obtained from either.

Nearly all parts of *Tephrosia vogeli* were found to contain tephrosin, the seeds (which, since the plant is perennial, should be used in preference to the leaves) containing 0·35, the leaves 0·18, the stems 0·9 and the pods 0·6 per cent., respectively. The presence of 12 per cent. fixed oil in the seeds complicates the process of extraction. The crushed seed is exhausted with 90 per cent. alcohol, which is distilled off until the remainder is equal in volume to the estimated volume of oil from the seed. Sufficient water is added in the cold to dilute the alcohol to 75 per cent. (at which point the oil just fails to be thrown out of solution), the whole mixture is filtered after several hours and the precipitated tephrosin is washed with several small quantities of ether. The product obtained by extraction is called crude tephrosin and is suitable for the preparation of insecticides. When dissolved in hot alcohol and allowed to crystallise slowly, crude tephrosin yielded about 20 per cent. of a substance crystallising in fine yellow needles with a melting point of 227°C, which is probably dehydrodeguelin and is not toxic [*cf. R.A.E.*, A **19** 309, etc.]. The remaining 80 per cent. forms large white tabular crystals with a melting point of 187°C., and is undoubtedly identical with Hanriot's tephrosin [**13** 159]. So far it has resisted separation unto constituents. Resins were obtained from most parts of the plant, but contrary to Tattersfield's results [**14** 512] were only slightly toxic.

In spraying tests a 0·5 per cent. extract of *Tephrosia* seeds was as effective against Aphids (probably *Toxoptera aurantii*, Boy.) on *Citrus* as the standard nicotine sulphate solution, both giving complete mortality. A number of tests were made with water extracts ; the dried and ground material was either soaked in cold water for 24 hours or boiled with water for 30 minutes, strained and diluted to the required strength, soft soap being added to make a ½ per cent. solution. The results indicated that an aqueous extract of the leaf is as toxic as an alcoholic extract if it is made with boiling water, but only about half as toxic if made with cold water. Extracts from the seeds made with boiling water were half as toxic as alcoholic extracts, but cold water almost failed to extract any toxic principle. Boiling for 60 minutes was no more effective than for 30 minutes. An extract of the leaves, made with boiling water and using ½ per cent. soft soap as a spreader, was successfully used against thrips (probably *Physothrips xanthocerus*, Hood) on experimental coffee trees.

Kerosene extracts of *Tephrosia* seeds used as sprays against *Antestia* and *Lygus* were about half as toxic (weight for weight) as kerosene-pyrethrum [*cf.* **21** 265], and were slower in acting, though they proved useful as fly sprays [B **23** 27] Moreover, tephrosin will not kill insects unless it comes into actual wetting contact with them,

and a kerosene extract of *T. vogeli* seed, unlike one of pyrethrum, is not effective in the form of a fine mist.

Although not comparable with pyrethrum powders, the finely powdered pod of *T. vogeli* has some value as an insect powder, probably because of the presence of tephrosal ; this oily liquid is an aldehyde combining with sodium bisulphite to give a white crystalline solid. The fixed oil from the seeds is non-drying ; a soft soap can be made from it, suitable according to preliminary tests for a spreader but not for domestic purposes.

It is considered that *Tephrosia vogeli*, which grows widely and vigorously in East Africa, should be able to replace nicotine almost entirely, since the extraction of crude tephrosin is practicable both in large and small quantities. It was found particularly effective against soft-bodied insects such as Aphids and thrips.

MARTIN (J. T.) & TATTERSFIELD (F.). **The Effect of environmental Conditions upon Pyrethrum** (*Chrysanthemum cinerariaefolium*). **I–II.**—*Ann. appl. Biol.* **21** no. 4 pp. 670–690, 3 pls., 12 refs. Cambridge, November 1934.

The following are substantially the authors' summaries : In experiments on the effect of environment on the pyrethrin content of flowers of *Chrysanthemum cinerariaefolium*, the pyrethrin I content of flowers from plants grown in heavy soil was not increased by fertilisers, and plants grown in soil of low fertility produced good yields of flowers rich in pyrethrins ; but since the plants were grown in pots and their root development made it impossible to continue the experiments beyond the third year, the conclusions on the effect of fertilisers are not authoritative. Under normal conditions, the extent to which plants produced pyrethrins was characteristic of the individual plant and depended upon an undetermined but probably genetical factor. A plant that initially produced flowers of high or low poison content continued to give flowers correspondingly rich in succeeding years, independently of the application of manures and of the number of heads produced. Plants from rooted shoots produced flowers similar in quality to those of the parent plant. In the fully opened flowers, the complete disk florets contained 90 per cent. of the total pyrethrins, and of this the greater part was found in the ovaries.

Studies with rooted shoots from single plants showed that plants partly shaded during the 5 months preceding flowering produced smaller flowers with a smaller pyrethrin content, probably because the metabolism is less intense when less light reaches the plants ; that plants that had experienced high temperatures in summer after low temperatures in winter flowered well, but those subjected to high winter temperatures did not ; and that large numbers of flowers were only produced when winter temperatures were low enough to induce a fairly long dormant period.

TATTERSFIELD (F.). **An Apparatus for Testing Contact Insecticides.**—*Ann. appl. Biol.* **21** no. 4 pp. 691–703, 1 pl., 5 figs., 2 refs. Cambridge, November 1934.

The apparatus used for spraying insects with contact insecticides in the laboratory since 1924 [*R.A.E.*, A **12** 225] gives a fairly even distribution of the spray, but can neither regulate its fineness nor the

time taken to deliver it. In the two new types of atomiser described, the current of compressed air dispersing the drop is in line with its path as it comes from the tube connected with the reservoir. A needle valve regulates the size of the droplets and the time taken in spraying any given amount. The distribution of the spray is governed by the size of the drops and the distance from the orifice of the surface sprayed. Graphs show the results of tests with these atomisers, in which were taken the weights of spray delivered upon surfaces of known area placed in different positions in the spray jars.

Newton (H. C. F.). **Insect Pests at Rothamsted and Woburn, 1932–3.** —*Rep. Rothamsted exp. Sta. 1933* pp. 51–53. Harpenden, 1934.

The first serious outbreak of flea-beetles since 1930 destroyed the entire second sowing of kale, the species concerned being *Phyllotreta undulata*, Kutsch. (50 per cent.), *P. nemorum*, L. (20 per cent.), *P. atra*, F. (14 per cent.), *P. diademata*, Foudr. (11 per cent.), *P. vittula*, Redt. (4 per cent.) and *P. nigripes*, F. (1 per cent.). The kale was sown on 16th May and was attacked during the last week in May and the first week in June. Two applications at the rate of 1 gal. per acre of atomised sprays of kerosene alone (as a repellent) or containing pyrethrum extract had no ultimate effect. From a resowing on 26th June a reasonable crop was obtained. The first sowing of kale (sown 26th April) escaped serious damage as it was already well established when the flea-beetles appeared.

Hylemyia coarctata, Fall., did not cause appreciable damage to wheat, although many tillers were destroyed; the attack was about twenty times as severe on fallowed as on unfallowed ground. *Agromyza* (*Domomyza*) *ambigua*, Fall., was rare and *Contarinia tritici*, Kby., and *Sitodiplosis mosellana*, Géh., less abundant on wheat than in the preceding year. Barley suffered from an unusually severe infestation by *Chlorops taeniopus*, Mg.

Mangels were attacked by *Atomaria linearis*, Steph., and *Bourletiella hortensis*, Fitch; sugar-beet was not seriously affected by either springtails or *Chaetocnema* (*Plectroscelis*) *concinna*, Marsh., which were occasionally present, but a heavy infestation by *Aphis rumicis*, L., combined with bad growing conditions, later brought growth to a standstill. Brussels sprouts were attacked by *Phorbia* (*Chortophila*) *brassicae*, Bch., *Aleurodes brassicae*, Wlk., and *Brevicoryne brassicae*, L., of which last 15 per cent. were parasitised by the Braconid, *Aphidius brassicae*, Marsh., 8 per cent. by the Pteromalid, *Asaphes vulgaris*, Wlk., and 1 per cent. by the Cynipid, *Charips* (*Allotria*) *brassicae*, Ashm.

Les insectes nuisibles aux peupliers.—*Bull. Comm. Ennem. Arbres* no. 16, 12 pp., 1 pl., 8 figs. Nancy, 1934. (Repr. from *Ann. Éc. Eaux For.* **5** no. 1. Nancy, 1933.) [Recd. December 1934.]

An account is given of the boring insects that attack poplar in France, and of the nature and effects of the injuries they cause [*cf. R.A.E.*, A **22** 193]. *Saperda* (*Compsidia*) *populnea*, L., which principally infests the stems and branches of second year wood, lays its eggs in a small hollow at the base of a horse-shoe shaped furrow. The larva hatches in about 10 days and mines under the bark, evacuating excrement and frass through the oviposition hole and producing a characteristic swelling. In September or October, or sometimes in the following spring, the larva reaches the medulla and mines an axial

gallery, which may be about 2 inches long at the end of the second year. It pupates here, and in May–June of the third year the adult beetle emerges from the gall through an opening in the side. Injury may be very severe in nurseries and young plantations, particularly when the stem is attacked, as it then breaks in a wind. The galls may be so close together that the larval mines meet, and in spite of cicatrisation the tree remains knotted and never attains really fine growth. *C. populnea* is particularly abundant on aspens, but also often occurs on cultivated poplars.

The adults of another Lamiid, *Saperda* (*Anaerea*) *carcharias*, L., appear in July and August, and feed on the parenchyma of the leaves and on the soft bark of the young shoots. The eggs are laid on the lower 6 ft. of the trunk in fissures in the bark of old trees, or in oviposition punctures in the soft bark of young ones. The larva hatches in the following summer and mines beneath the bark before penetrating horizontally into the heart of the wood, where it overwinters. During the next summer it descends to the root, and afterwards bores upward again through the centre of the tree and prepares a hole for the adult to emerge. Pupation takes place in June, and the adult emerges a fortnight later. The damage caused by the larva admits air and moisture into the inner layers of the wood, and old trees easily fall victims to pathogenic organisms.

The adult of the Curculionid, *Cryptorrhynchus lapathi*, L., which appears in August, feeds on the bark of young branches and hibernates under moss, or in crevices of the bark, larval mines or débris, from which it emerges in May only to pair and oviposit. The eggs are laid, often several together, in a small hole excavated on young trees, either near the leaf buds or in pruning scars or other injuries to the bark, preferably on the lower part of the tree. The larvae, which hatch in the following spring, work through the cambium into the wood. The bark turns brown and shows surface injuries that look like canker. Pupation takes place near the entrance hole, and the adult emerges after 2–3 weeks. In young plantations the infested branches wilt and break off, and the mines become foci for fungous diseases. Willows, birches and elms are also attacked.

Trochilium apiforme, L., oviposits on the lower part of the trunk at the point where the large roots branch off. The larvae, which hatch in 4 weeks, penetrate the bark and hibernate under it. During the second year they mine in the roots and trunk. They pupate in April–May of the following year in a cocoon made of woody débris, either close to the emergence hole or in the soil near a root. Two other Aegeriids, *Sciapteron tabaniforme*, Rott., and *Aegeria vespiformis*, L., have a similar life-history, except that they prefer the young shoots and low branches. They form galls similar to those of *C. populnea*, but without the horse-shoe shaped scar.

The adult of *Cossus cossus*, L., which emerges in July, remains motionless on the bark during the day. The female usually lays several eggs together in cracks in the bark. As soon as they hatch, the larvae enter the interior of the tree where they mine winding galleries 10–15 mm. in diameter. The life-cycle occupies two to three years. Pupation occurs in May at the entrance of a mine or at the foot of the tree in a cocoon of mixed wood fibre and soil, the adult emerging a few weeks later. Wood attacked by *C. cossus*, which mainly injures the trunk and large branches, loses all commercial value. Another Cossid, *Zeuzera pyrina*, L., causes similar damage and develops under

the same conditions, but the larva chooses the smaller branches and when it has reached the centre of the stem or branch mines along the axis. Both insects attack other trees such as chestnut, elm, willow and apple, and their activities favour the spread of canker more than do those of any other of the species mentioned.

The usual measures against wood-boring insects are recommended for control, including proper tree-sanitation, the removal of infested branches and the destruction of severely infested trees, the application of repellents to the trunks, and the insertion of suitable fumigants into the mines of the larvae. The emergence of adults can be prevented by covering the orifices of the principal mines with glue.

Brief notes are also given on species of the Chrysomelid genera *Melasoma* (*Lina*) and *Phyllodecta*, which attack the foliage of poplar. Control measures recommended include the hand collection of larvae and adults and spraying and dusting with insecticides.

Hsin (C. S.). **Zur Kenntnis einiger Blattwespen.** [On Knowledge relating to some Sawflies.]—*S. B. naturf. Ges. Rostock* (4) **5** 1934–1935, pp. 13–18. Rostock, separate dated 15th September 1934.

These preliminary notes record observations in Mecklenburg in 1932–1934. Several species of *Diprion* (*Lophyrus*) were observed on pine, of which *D. frutetorum*, F., was the commonest, other being *D. virens*, Klug, *D. laricis* var. *fenestratus*, Ensl., *D. nemoralis*, Ensl., *D. similis*, Htg., and *D. socius*, Klug, which was rare. Details are given of the colour and position in the pine needles of the eggs of all these species except *D. similis*. Females of the first three species oviposited, without mating, on the day of emergence, provided that the weather was sufficiently warm, but even when caged on pines in the open they usually died before laying all their eggs. They laid one egg in each pine needle. In captivity *D. frutetorum*, *D. virens* and *D. laricis* had two generations a year. The larvae of the first generation of *D. virens* spun their cocoons in July, the majority in moss on the ground and a few in the tree crown. All the first generation larvae of *D. frutetorum* spun their cocoons in the moss.

Of sawflies on larch, *Lygaeonematus laricis*, Htg., had two generations a year and *L.* (*Nematus*) *erichsoni*, Htg., had one. *L. wesmaeli*, Tischb., oviposited in the basal third of the needle. Larvae of this species collected in 1933 spun their cocoons in moss on the ground and neither in nature nor in thermostats at high temperatures did emergence take place until 1934. In 1934, 40 per cent. of the larvae remained in the moss and 60 per cent. entered the ground. This species and *L. laricis* reproduced parthenogenetically. The larvae of *Platycampus duplex*, Lep., were always found, but only singly. Larvae of *Platycampus luridiventris*, Fall., which occurred on alders, were not observed until July, though an adult was found in May. The larvae of the two species of *Platycampus* are described.

Speyer (W.). **Die an der Niederelbe in Obstbaumfanggürteln überwinternden Insekten. IV. Mitteilung. Coleoptera : Chrysomelidae.** [Insects hibernating in Fruit-tree Trap-bands in the Lower Elbe Districts. Fourth Communication.]—*Z. PflKrankh.* **44** no. 12 pp. 577–585, 21 refs. Stuttgart, 1934.

In this fourth communication [*cf. R.A.E.*, A **22** 493, etc.] an annotated list is given of the 18 Chrysomelids (*sens. lat.*) found between

1926 and 1932 in shelter-bands on fruit trees. They did not include any orchard pests, but many of them are known to damage crops. The commonest were *Phyllotreta nemorum*, L., and *P. undulata*, Kutsch., which are serious pests of crucifers, *Hydrothassa marginella*, L., and *Phyllodecta vulgatissima*, L., which is very injurious to basket willows.

RADEMACHER (B.). **Was lehrt uns das Läusejahr 1934 für den Pferdebohnenbau ?** [Broad Bean Cultivation and the Aphid Year 1934.] —*Kranke Pflanze* **11** no. 12 pp. 149–153. Dresden, December 1934.

The dry summer of 1934 in Germany resulted in outbreaks of *Aphis fabae*, Scop., the chief pest of broad beans. Infestation starts at the edges of the fields, owing to migration from winter food-plants, and gradually spreads inwards.

The following measures are suggested : An abundant supply of water to the plants, early sowing so that the shoots will be well-grown and the pods developed before the appearance of the Aphids in number in June and July, wide spacing, ample manuring with potash, planting some rows of oats (or a similar crop) at the edges of the fields, removing the first infested shoots in spring, growing oats, vetches or fodder peas with the beans, and dusting or spraying with a suitable insecticide.

Attempts are being made to produce a resistant variety of bean. In 1934 varieties fairly resistant to *A. fabae* suffered severely from *Macrosiphum onobrychis*, Boy. (*pisi*, Kalt.), which of recent years has often been a serious pest of beans, vetches, peas and lucerne.

DINGLER (M.). **Die kleine Spargelfliege** (*Melanagromyza simplex* **Löw**). [The Small Asparagus Fly.]—*Anz. Schädlingsk.* **10** no. 12 pp. 135-139, 2 figs., 11 refs. Berlin, 15th December 1934.

A note is given on the classification and distribution of *Agromyza* (*Melanagromyza*) *simplex*, Lw., which mines in the stalks of asparagus. Its morphology and biology are described from the literature on it in France and the United States. It also occurs in Hungary, but is at present very rare in Germany.

MAGERSTEIN (V.). **Ueber die Beschädigung der Weiden durch den Weidentriebspinner** *Earias chlorana* **L. und die Weidenrosengallmücke** *Rhabdophaga rosaria* **H. Loew, Kieff.** [On Injury to Willows by *E. chlorana* and *R. rosaria*.]—*Anz. Schädlingsk.* **10** no. 12 pp. 141–145. Berlin, 15th December 1934.

An outbreak of *Earias chlorana*, L., and *Rhabdophaga rosaria*, H. Lw., occurred in 1933 in the willow-growing districts of eastern Moravia. Willow rods for basket making must be smooth and without branches and injury by these insects causes branches to be put forth. *Earias* usually has two generations a year ; a third sometimes occurs if the autumn is warm, but it usually fails to develop sufficiently for hibernation. The eggs are laid singly on the rod-tips. The larva spins the terminal leaves and beneath this shelter feeds from the tip downwards, consuming the young leaves and the buds and making a furrow 2–6 inches long. According to the amount of injury, several shoots are formed. In 1930–32, *E. chlorana* was the commonest pest of *Salix viminalis* and did considerable damage to other willows. The spring generation attacked the strong shoots of the stocks, and the

summer generation injured the weaker shoots that were then maturing. In 1932, 40–45 per cent. of the rods were attacked, and there was a third generation, nearly all the larvae of which were killed by severe frosts in October. The webs of the summer and autumn generations contained several larvae because other pests, especially *R. rosaria*, had reduced the number of terminal buds. The deformations caused by both pests are described in detail.

R. rosaria develops in the terminal bud, in which one egg is laid. The bud is destroyed, and the leaves of the lateral buds become abnormally large and crowded into a rosette. Before 1932 this Cecidomyiid occurred in Moravia only on wild willows, but in that year cultivated willows were attacked and 50–60 per cent. of *S. viminalis* were infested. Strong, nearly mature rods were not attacked, and rosette shoots developed only on those leaf-rosettes that were not in the shade. The rods that branch following injury by *E. chlorana* and *R. rosaria* develop to an abnormal extent, with the result that most of the unbranched rods die, and the whole willow plant is weakened.

Morawski (F.). **Pasorzyty wtórne szkodników leśnych z nadrodziny Chalcidoidea.** [Secondary Parasites of the Superfamily Chalcidoidea of Forest Pests.] [*In Polish.*]—*Wydaw. Szk. główn. Gosp. wiejsk. Warsz.* **1** reprint 21 pp., 15 figs., 12 refs. Warsaw, 1934. (With a Summary in German.)

After discussing the habits of secondary parasites, which often completely annul the value of primary parasites of insect pests, the author points out that their economic importance has been underestimated, probably because the study of their bionomics is complicated by the fact that certain species may act both as primary and as secondary parasites. Chalcidoids reared by him from cocoons of a Braconid of the genus *Apanteles* collected in central Poland in 1926 and 1927 were *Eurytoma appendigaster*, Swed., the Torymid, *Monodontomerus dentipes*, Boh., and the Pteromalids, *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.), *Habrocytus eucerus*, Ratz., and *Mormoniella vitripennis*, Wlk., and *Mokrzeckia pini*, Htg. [*cf. R.A.E.*, A **22** 495]. A key to these species is given, followed by descriptions of each and notes from the literature on its bionomics.

Glover (P. M.). **A Check List of the Chalcidoidea bred at Namkum from the Lac Insect *Laccifer lacca* with some Notes as regards their Function, Importance and Control.**—*Bull. Indian Lac Res. Inst.* no. 21, 14 pp., 8 refs. Calcutta, 1934. Price *Rs.*1.

In India the following Chalcidoids [*cf. R.A.E.*, A **12** 16; **22** 310; etc.] have been bred from *Laccifer lacca*, Kerr: *Eupelmus tachardiae*, How., of which *Brasema annulicaudis*, Cam. [**19** 650, etc.] is a synonym, the Encyrtids, *Tachardiaephagus tachardiae*, How., *T. somervilli*, Mahd., *Parechthrodryinus* (*Copidosoma*) *clavicornis*, Cam., and *Erencyrtus dewitzi*, Mahd., the Aphelinids, *Coccophagus tschirchii*, Mahd., and *Marietta javensis*, How., previously recorded as *Perrisopterus* sp. [**19** 650; **22** 166], and the Eulophid, *Tetrastichus purpureus*, Cam. Their importance in the various crops of lac produced during 1928–34 is discussed and simple, cultural methods are recommended for their control [**20** 575; etc.], which are also particularly effective against the predacious moths, *Eublemma amabilis*, Moore, which is parasitised by *Elasmus claripennis*, Cam., and *Brachymeria tachardiae*, Cam., and

Holcocera pulverea, Meyr., which is parasitised by *Eurytoma pallidiscapus*, Cam. During 1928–32, parasites destroyed an average of 4·6 per cent. of the cells of the lac insect [*cf.* **22** 310], of which over 33 per cent. were males. During 1930–34 an average of only 3·6 per cent. of them were attacked by the hyperparasites *T. purpureus*, *Eupelmus tachardiae* and *M. javensis*, which, since they are also primary parasites of *L. lacca*, are not worth encouraging.

Ramakrishna Ayyar (T. V.). **Insecticides and their Use in India.**—*Madras agric. J.* **22** no. 10 pp. 345–353, 12 refs. Coimbatore, October 1934.

The author indicates briefly some of the fundamental facts regarding insecticides with reference to general agricultural conditions in India, reviews experience so far obtained there, and finally indicates the methods by which their employment may be encouraged and their efficacy increased.

Sugarcane Borers and their Control in the Mysore State.—*Circ. Mysore agric. Dep.* no. 53, 9 pp., 10 figs., 2 pls. Bangalore, 1934.

An account is given of the bionomics [*cf. R.A.E.*, A **21** 674] and control of the dead-heart borers, *Argyria sticticraspis*, Hmps., and *Diatraea venosata*, Wlk., and of the central-shoot borers, *Scirpophaga nivella*, F., and *S. monostigma*, Zell., on sugar-cane in Mysore. The life-history of *S. monostigma* is similar to that of *S. nivella*. *A. sticticraspis* is more numerous and causes greater injury than *D. venosata*. In young cane the larvae of both tunnel in the soft tissues as far as the roots. Injury to older canes, on which the eggs are laid on the sheathing leaves of the top shoots, is only serious in soft varieties and in severe infestations. The larvae of *Scirpophaga* bore through the growing shoot into the hard parts of the cane and make an opening on one side. Grown canes are more seriously damaged than young ones. Although new shoots replace the injured ones, growth is always noticeably checked, so that there are different stages of maturity at harvest. In older canes, where a secondary invasion by fungus occurs, the tissues become reddish and the juice turns sour, with a resulting reduction in the quality of the jaggery and the output of sugar.

Control measures include trapping the adults of the dead-heart borers in bundles of trash, collecting the eggs (which should preferably be stored to allow egg-parasites to escape), catching the adults of *Scirpophaga* on the leaves, adequate irrigation, clean cultivation and the selection of borer-free setts for planting. In large scale plantings the setts may be immersed in cold water for 2 days to kill any borers in them, otherwise any part of the cane except the tops should be planted. Shoots showing dead-heart should be cut off at the base close to the roots, without injuring the side shoots, and in severe early infestations small quantities of nitrogenous manure should be afterwards applied to ensure uniform maturity at harvest.

Hoh (K.). **A Study of *Urochela luteovaria* Distant.** [*In Chinese.*]—*J. Sci. nat. Univ. Shantung* **1** no. 2 pp. 452–466, 15 figs., 7 refs. Tsingtao, China, July 1933. (Abstr. in English in *Lingnan Sci. J.* **13** no. 3 p. 554. Canton, July 1934.)

Descriptions are given of the 5 nymphal instars and adult of the Pentatomid, *Urochela luteovaria*, Dist., a serious pest of pear in China.

The average duration of each instar is a week. Pairing occurs in September. A single female lays 30–50 eggs in masses in cracks in the bark. Some of these hatch in 4–7 days and the nymphs hibernate, but others do not hatch till March of the following year. The bugs not only puncture the leaves, but also deposit some organic substance on the fruit, causing uneven growth. Effective control is obtained by cutting off and burning the bark and shaking the nymphs and adults from the trees.

Treillard (M.). **L'insectarium expérimental de l'Institut Pasteur de Saïgon : conception et fonctionnement.**—*Bull. Soc. Path. exot.* **27** no. 9 pp. 863–865, 2 pls., 1 plan. Paris, 1934.

An illustrated description (together with a plan) is given of the insectarium of the Pasteur Institute of Saïgon, which was completed in 1932.

Uichanco (L. B.). **A Twenty-Five Year Balance Sheet for Economic Entomology.**—*Philipp. Agric.* **23** no. 5 pp. 419–429, 2 figs. Laguna, P.I., October 1934.

Two types of periodic fluctuations in insect abundance have been recognised in the Philippines, seasonal fluctuations during the year and fluctuations over periods covering a series of years. During the dry season Coccids, flea-beetles, and *Agromyza phaseoli*, Coq., are numerous, whereas *Leptocorisa acuta*, Thnb., and *Perkinsiella vastatrix*, Bred., attain their greatest numbers, towards the end of the rainy season. These species have fairly short life-cycles and have several broods during the year, so that their abundance is probably due to a temporary relaxation of certain natural controlling factors. Among Coccids, entomogenous fungi, such as *Aspergillus parasiticus* on *Trionymus sacchari*, Ckll., and *Aschersonia sclerotioides*, *Microcera coccophila*, *M. aurantiicola*, and *Myriangium duriaei* on *Citrus* scales, exert a controlling influence during wet weather but not during dry. *P. vastatrix* and *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) apparently aestivate during the dry weather. *Spodoptera mauritia*, Boisd., and *Cirphis loreyi*, Dup., infest rice and sugar-cane respectively (though they are potential pests of both plants), since larvae of *Cirphis* usually appear towards the end of the dry season, when late-planted canes are susceptible, but rice planting has not begun, and those of *Spodoptera* at the beginning of the rainy season, when the leaves of the sugar-cane are too tough to serve as food but the rice is usually young and tender. Fluctuations in abundance over longer periods have been noted in several species, notably in *Locusta migratoria*, L., the same characteristic apparently being exhibited by *Promecotheca cumingi*, Baly. Weeds appear to have an important influence on insect pests ; thus *Cylas formicarius*, F., thought at first to be monophagous on sweet potato, was subsequently found to breed also on a common congeneric weed, *Ipomoea triloba*. Fruits of *Artocarpus integrifolia* and of *Anona squamosa* were severely damaged by *Dacus* (*Bactrocera*) *umbrosa*, F., and *Heterographis bengalella*, Rag., respectively when they were grown on the outskirts of forests, but were relatively free from infestation in thickly populated districts, so that it is probable that the pests normally breed in forest fruits.

Beneficial insects that have been introduced (but are not known to have become established) include *Encarsia flavoscutellum*, Zhnt., brought from Java in 1928 and from Formosa in 1929 for use against *Oregma* (*Ceratovacuna*) *lanigera*, Zhnt., and *Ceromasia sphenophori*, Villen., against **Rhabdocnemis lineaticollis*, Heller, and *Telenomus nawai*, Ashm., and *Euplectrus platyhypenae*, How., against *Spodoptera mauritia*, from Hawaii in 1928.

Controlled observations on the Philippine bamboo (*Bambusa spinosa*) commonly used in constructional work has shown that cutting at fixed times does not result in immunity from powder-post beetles [*Lyctus*]. Certain pieces of stem cut at any time during the year were susceptible to infestation, although presumably mature. But a practical test for selecting bamboo is provided by the observation that signs of invasion appeared within a month of cutting, and that pieces that showed immunity during that time continued free from infestation. Unfortunately this is not true of *Bambusa vulgaris*.

Ocfemia (G. O.). **Our Work on Plant Diseases.**—*Philipp. Agric.* **23** no. 5 pp. 467–475, 2 figs. Laguna, P.I., October 1934.

This account of the investigations on plant diseases carried out by the Philippine College of Agriculture since its foundation includes references to work on the transmission of bunchy-top of manila hemp [*Musa textilis*] by *Pentalonia nigronervosa*, Coq. [*R.A.E.*, A **22** 658, etc.], and of Fiji disease of sugar-cane by *Perkinsiella vastatrix*, Bred. [**22** 504].

Miller (N. C. E.). **Coleopterous Pests of Stored *Derris* in Malaya.**—*Sci. Ser. Dep. Agric. S.S. & F.M.S.* no. 14, 34 pp., 2 pls., 24 refs. Kuala Lumpur, 1934. Price *Cts.* 50.

A list is given of eleven species of Coleoptera, the larvae and adults of which bore in stored roots of *Derris* in Malaya [*cf. R.A.E.*, A **19** 647; **21** 677; **22** 614]. An attempt was made to determine the type of food substance actually assimilated by them. Preliminary experiments showed that the action of water alone was almost as lethal to the larvae and adults of *Sinoxylon anale*, Lesn., when they were immersed in it, as aqueous extracts of *D. elliptica* and *D. malaccensis*. To determine whether the toxins in the roots of *Derris* were rendered innocuous by symbionts living in the alimentary tracts, large numbers of these two stages were dissected and their excrement and frass examined, but neither bacteria nor protozoa, such as occur in other species infesting dead wood, were found. Usually the whole root with the exception of the cortex is reduced to a fine powder, and it is possible that the latter is rejected because it contains greater and more concentrated amounts of toxins. When small pieces of the cortex were supplied as compulsory food, only *S. anale* and *Xylopsocus capucinus*, F., consumed it, and then only in small quantities; *S. anale* and *Dinoderus minutus*, F., lived about 7 and *X. capucinus* about 10 days. When other insects, however, were sprayed with or immersed in solutions prepared from the cortex and from the internal tissue, the latter was the more toxic. Examples of these 3 species were induced to bore for a short distance into portions of root from which the cortex had been removed, but they died in a few days; in another experiment adults of *X. capucinus*

*Probably an error for *Trochorrhopalus strangulatus*, Gyll., see *R.A.E.*, A **17** 903 (note) and **20** 213.—Ed.

bored deeply into the root, but they laid no eggs and died within 3 weeks. Starch is the food of the larvae of Lyctids [**20** 454], one of which, *Minthea rugicollis*, Wlk., attacks *Derris* roots in Malaya. Roots of *D. elliptica* are susceptible to attack after 4 or 5 days drying in the sun ; both this variety and *D. malaccensis* may be invaded by Bostrychids after six months or more in storage. Starch occurred throughout the internal tissues of derris root, but was unevenly distributed ; in some sections examined a narrow area close to the cortex was almost devoid of starch.

Chemical analysis of a quantity of frass and of the root from which it was derived showed that the toxic substances occur in smaller amounts in the frass than in the root, but starch and other hydrolysable carbohydrates other than cellulose in larger amounts. Isolated excreta contained starch, pentosans and a substance extracted with ether, which although it did not contain rotenone was toxic to fish. Since the proportion of poisons is reduced in the frass as a whole, the adults or the larvae must reduce its quantity by transformation. Rotenone is most probably distributed throughout the root in a colloidal state, so that larvae almost certainly ingest it. The adult stage is generally reached before the heart-wood is attacked.

A brief account is given of the alimentary system of Bostrychids, and the stages and bionomics (of which a general description has already been noticed [**22** 614]) of *S. anale*, *X. capucinus* and *D. minutus* are described in detail. In the laboratory, larvae of *X. capucinus* completed their development in frass, but predators would probably reduce their chances of survival under natural conditions. *Tenebroides mauritanicus*, L., and *Alloeocranum* (*Peregrinator*) *biannulipes*, Montr. & Sign., have been observed in association with this species, and preyed upon its larvae in the laboratory. It has been recorded as attacking *Caryocar villosum*, *Nephelium lappaceum*, rubber (*Hevea brasiliensis*) and *Dipterocarpus* sp. in addition to *Derris*. Eggs of *D. minutus* were found among the frass, and the larvae and adults from these survived therein for several months.

Various control measures [**22** 615] are discussed. A quantity of root left over from packing a chest was stored in a sack and remained uninfested. It is essential that the root should be dried, cut and packed as quickly as possible. In the laboratory, derris root became attractive to *S. anale*, *X. capucinus* and *D. minutus* after 4, 2 and 1 days, respectively. Beetles were observed boring to a slight extent into roots that were quite moist.

VAN DER GOOT (P.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1932.** [Diseases and Pests of cultivated Plants in the Netherlands Indies in 1932.]—*Meded. Inst. PlZiekt.* no. 83, 80 pp. Buitenzorg, 1934. Price *Fl.* 1·50.

Pests recorded in the Netherlands Indies in 1932, many of which have been noticed from previous reports [*R.A.E.*, A **22** 547 ; etc.], include the Hypsid, *Argina cribraria*, Clerck, which injured seedlings of *Crotalaria juncea* very seriously ; the Pyralid, *Margaronia* (*Hedylepta*) *indica*, Saund., and the Noctuid, *Phytometra* (*Plusia*) *chalcites*, Esp., on soy beans [*Glycine hispida*] ; the Hesperiid, *Parnara mathias*, F., on rice ; the Coreid, *Dasynus piperis*, China, on pepper [*Piper*] ; and the Geometrid, *Hyposidra talaca*, Wlk., on coffee.

Miller (D.). **Garden Pests in New Zealand. A popular Manual for practical Gardeners, Farmers and Schools.**—*Cawthron Inst. Monog.* Med. 8vo, 84 pp., 14 figs. Nelson [N.Z., 1934]. Price 2*s.* 6*d.*

The character and scope of this handbook is largely indicated by its title. Beginning with a general review of the animal kingdom, it contains chapters on soil organisms and soil fertility, the structure and life-histories of insects, and the principles of pest control, as well as several (pp. 29–73) dealing specifically with the bionomics of the insects and other pests that attack garden plants in New Zealand.

Zeck (E. H.). **Notes on Aphididae or Plant Lice (Homoptera) ii.**—*Aust. Nat.* **9** no. 2 pp. 33–36, 1 ref. Sydney, October 1933. [Recd. December 1934.]

Short notes are given on the morphology, biology and geographical distribution of the following Aphids observed in New South Wales, and recorded for the first time from Australia : *Aphis bambusae*, Fullaw., on bamboo, *Cavariella capreae*, F., on willow, *Aphis* (*Rhopalosiphum*) *pseudobrassicae*, Davis, on stocks, *Capitophorus potentillae*, Wlk. (*tetrarhodus*, Wlk.) on roses, *Macrosiphum onobrychis*, Boy. (*pisi*, Kalt.) on sweet peas, *Phorodon menthae*, Buckt., on garden mint, *Myzocallis castanicola*, Baker, on oak (*Quercus robur*), *M. viridis*, Takah., on *Ulmus chinensis*, and *Tetraneura ulmifoliae*, Baker, on roots of *Panicum sanguinale*.

Pescott (R. T. M.). **Codling Moth Control. Results of Experiments, 1933–34.**—*J. Dep. Agric. Vict.* **32** pt. 10 pp. 503–516, 11 figs., 3 graphs. Melbourne, October 1934.

Experiments in Victoria in 1933–34 on the control of the codling moth [*Cydia pomonella*, L.] on apple in general confirmed the value of substituting white oil emulsion for lead arsenate in the later sprays [*cf. R.A.E.*, A **22** 22, etc.]. A slight increase in control sometimes obtained by adding nicotine sulphate to the white oil sprays did not justify its cost.

Pescott (R. T. M.). **The Pear Leaf Blister Mite (*Eriophyes pyri* Pagen.).**—*J. Dep. Agric. Vict.* **32** pt. 10 pp. 538–539, 3 figs. Melbourne, October 1934.

In Victoria, the adults of *Eriophyes pyri*, Pgst., overwinter under the bud scales, or sometimes at the base of the buds, in old leaf scars, etc. They begin to lay their eggs on the lower surfaces of the unfolding leaves as soon as the buds open in the spring. The young larvae burrow through the leaf surface and feed on the leaf tissues, causing greenish blisters to appear. The flower stalks may also be injured before the flowers open, and become thick and distorted. The developing fruits may be seriously damaged after the petals fall, and blisters are formed on the surface ; most of this injury disappears by midsummer, but in exceptional cases severe russeting and cracking of the fruit may occur. At maturity, the adults leave the blisters in which they have developed through minute holes in the lower surfaces of the leaves and commence oviposition. Reproduction and migration continue throughout the summer, and in favourable conditions the new leaves are infested as they appear. The blisters turn dark brown or

yellow as the season advances, and many of the leaves fall. In heavy infestations the fruit buds turn brown early in the winter and frequently burst open. During the winter the buds are very dry and drop easily. Many of the buds fail to open, and those that do, produce only one or two flowers that fail to set fruit. Only uninfested nursery stock should be used for planting. The dormant spray of strong lime-sulphur used to control the San José scale [*Aspidiotus perniciosus*, Comst.] also reduces the numbers of *E. pyri*.

Petch (T.). **Contributions to the Flora of Tropical America: XX.**—*Kew Bull.* 1934 no. 5 pp. 202–205, 1 ref. London, 1934.

This paper comprises a list of entomogenous fungi collected in British Guiana, including *Cordyceps tuberculata* and *C. polyarthra* on Lepidoptera, *C. dipterigena* on Diptera, *C. lloydi*, *C. bicephala* and *Ophiocordyceps unilateralis* on various ants, *C. sphecocephala* on a wasp, and *Stilbum buqueti* on a weevil.

Ogloblin (A. A.). **El curculiónido podador del algodonero** *Chalcodermus bondari* **Marsh.** [The Weevil Borer of Cotton.]—*Bol. Minist. Agric. Argent.* **36** no. 2 pp. 121–136, 1 fig., 4 pls., 11 refs. Buenos Aires, 1934.

This study was made following a report of injury from December 1930 to March 1931 to cotton in the Chaco territory, Argentina, by *Chalcodermus bondari*, Mshl. [*R.A.E.*, A **15** 237, 610], which attacked young plants developing their first branches and caused considerable loss. The author quotes the original descriptions of this weevil and of *C. niger*, Hustache, and suggests that the former may be a synonym of the latter. The distribution of *C. bondari*, which attacks various malvaceous plants, is discussed, and the immature stages described. The adults were rarely seen by day. Their feeding left scattered punctures on the shoots, while the female made a ring of punctures on the flowering shoot above which it cut a canal and laid an egg. The protoplasm and plastic substances that accumulate about the punctures provide food for the larvae. Infested plants lost both leaves and flower-buds. The larvae were parasitised by a Pteromalid and by *Eurytoma* sp., and were also infested by fungi, particularly when pupating. In May 1931, the author found the weevils to be very scarce on cotton, but much more numerous on *Althaea*. In February 1933, they occurred in approximately equal numbers on *Althaea* and cotton, but examination of a large number of flowering shoots indicated that they would only reduce the crop by about $\frac{3}{4}$ per cent. An arsenical spray might be applied if serious injury is threatened. Other proposed control measures are discussed, and it is concluded that the destruction of the undergrowth of malvaceous weeds in the field is likely to be the most efficient, since such weeds are the only food-plants during the autumn.

Jacob (H.). *Schistocerca paranensis*, **Burm. Bemerkungen über den Heuschreckeneinfall am Alto Paraná im September 1933.** [*S. paranensis*. Notes on the Locust Invasion on the Upper Paraná in September 1933.]—*Ent. Jarhb.* **44** pp. 123–126. Leipzig, 1935.

Swarms of *Schistocera paranensis*, Burm., appeared in Paraguay in September 1933. Many of the locusts were killed by feeding on bundles

of favourite food-plants, particularly a stinging nettle, *Urera caracasana*, to which a liquid bait of sugar, syrup or honey and arsenic had been applied. The mature locusts that oviposited came from the south and south-west, and the young ones departed in a westerly direction.

SEÍN, JR. (F.). **Para combatir el gorgojo del plátano. Metodo de mondar la semilla.** [Combating the Banana Weevil. The Method of cleaning the Seed.]—*Circ. Estac. exp. agríc. Rio Piedras* no. 103, 11 pp., 3 figs. S. Juan, P.R., 1934.

Planting material free from infestation by *Cosmopolites sordidus*, Germ., in Porto Rico is obtained by removing the leaf-sheaths and further cutting away all infested portions of the banana seed-corm. The uprooting, cleaning and planting of the corm should be effected on the same day to avoid reinfestation. If immediate planting is not possible, the corms must be stored where the ovipositing females cannot reach them.

MENOR [Y] O[RTEGA] (J. G.). **Insectos que atacan al Pino en la República.** [Insect Pests of Pines in the Republic of Santo Domingo.]—*Rev. Agric. Com. S. Domingo* **25** no. 60 pp. 1372–1373. S. Domingo, September 1934.

Pines in Santo Domingo are attacked by the Coccids, *Aspidiotus* sp.* and *Chionaspis pinifoliae*, Fitch, and the Aphid, *Cinara pinicola*, Kalt., but they cause little injury and could be controlled by spraying with oil emulsion. The larvae of a Syrphid, *Baccha clavata*, F., and the Coccinellid, *Cycloneda sanguinea*, L., are predacious on *Cinara*. The Tortricid, *Rhyacionia* sp., which attacks the tender buds, is more injurious, but can be controlled by removing the infested buds or by dusting them with an arsenical.

JONES (H. A.), BAILEY (S. F.) & EMSWELLER (S. L.). **Thrips Resistance in the Onion.**—*Hilgardia* **8** no. 7 pp. 215–232, 4 figs., 45 refs. Berkeley, Calif., June 1934. [Recd. December 1934.]

The more important papers concerned with the selection and breeding of plants resistant to sucking insects are reviewed. The causes of resistance in plants to insects have been classified as physical, chemical or physiological, but in none of the numerous cases cited has the exact nature of resistance been determined. The experiments in California here described show that, in the case of the onion (*Allium cepa*), certain varieties do possess a definite resistance to *Thrips tabaci*, Lind., which causes enormous damage to the crop in that State. In view of a slightly greater resistance observed in the Spanish variety of onion, seed obtained from many countries (including some from western Asia where the onion is believed to have originated) has been tested in breeding plots together with most of the varieties commonly grown in California. The results secured did not entirely agree with those of McLeod [*R.A.E.*, A **21** 234]. In 1931, when infestation was very severe and most of the varieties in the experimental plots were killed

*The author gives *Aspidiotus pinicola*, but no species with this name is known in the genus; possibly *A. pini*, Comst., was intended.—Ed.

early in the season, one introduced from Persia remained green and showed no injury. The Spanish types, although showing somewhat less injury than the American, were also killed prematurely. Data from daily counts of thrips population on several varieties in 1932, and on a much larger number in 1933 agree closely.

In 1933, seedlings were transplanted to the field on 29th March 1933 and were spaced 3 inches apart in rows 18 inches apart. Furrows between the rows supplied irrigation. A fairly accurate estimate of the population was obtained by counts of the larvae, which do not move from plant to plant, made at 5-day intervals from 9th May onwards. All varieties were compared with White Persian, on which the lowest mean number of larvae per plant (4·14) was found. As the varieties fell practically in the same order in 1933 as in 1932, certain of their characters probably influenced the thrips population. Japanese onion (*Allium fistulosum*), which has foliage somewhat like that of White Persian, has a thrips population nearly as low, but the thrips injured its leaf tissue much more severely.

The resistance of White Persian to thrips seems to be determined by two groups of factors, one controlling those characters that are unfavourable to thrips development, the other helping the plant to withstand injury. In the first group, the shape of the leaves, the angle of divergence of the two innermost leaves and the distance apart of the leaf blades on the sheath column seem to be of considerable importance. In White Persian the leaves are almost circular in cross section and give a minimum of protection against insect enemies and adverse weather. A marked increase in the number of thrips that occurred on White Persian plants, the leaves of which had been pulled together and so tied as to increase the amount of contiguous leaf surface, shows that closely bunched leaves provide a favourable environment for the thrips. Moreover, since the increase in the number of larvae after the leaves were tied was more rapid in the Persian variety than in another variety similarly treated, the resistance of the former is probably not caused by any toxic component within the plant. In White Persian each new leaf extends its sheath farther beyond the one encircling it than in other commonly cultivated varieties, producing an extremely long sheath column. If commercial varieties of onions had these leaf characters, more efficient control could be obtained by dusting and spraying, as practically all the foliage would be exposed to the insecticide.

It has been observed that thrips injury becomes most conspicuous following the first hot days of summer when the foliage dries and dies off. Leaf colour may be a factor in resistance to injury because the temperature in White Persian leaf tissue is possibly lower than in those varieties having darker green foliage. Areas where feeding has taken place become somewhat lighter in White Persian than the surrounding areas, but do not dry out. Measurements indicated that the thickness of leaf tissue is not a primary factor in the resistance of this variety. White Persian is a large white onion imported into California from Persia, where it is considered by the peasants to be the best of a number of local varieties and is grown under irrigation about 3,000 ft. above sea level. Three crops of bulbs of this variety and two of seed have now been grown in California. The bulbs tend to split badly and have poor keeping qualities. They mature late and have an exceptionally mild flavour unlike any of the commercial varieties now grown in the United States. Their strong tendency to bolt is not worse than that

of many other varieties. It is therefore proposed to cross this resistant variety with the existing important commercial types with a view to incorporating in them its resistant characters. An account is given of the methods employed in breeding for resistance and of the work hitherto done in this direction.

Daniels (L. B.). **The Tomato Psyllid and the Control of Psyllid Yellows of Potatoes.**—*Bull. Colo. agric. Exp. Sta.* no. 410, 18 pp., 5 figs., 5 refs. Fort Collins, Colo., June 1934. [Recd. December 1934.]

An account is given of the bionomics [*R.A.E.*, A **18** 111 ; **19** 556] and distribution of *Paratrioza cockerelli*, Šulc, which has been known to cause psyllid-yellows of potatoes in Colorado since 1927. It shows a preference for wild and cultivated solanaceous plants. Hot, dry seasons have been considered most favourable for Psyllid injury, and the result of attack is a poor yield composed largely of small potatoes. During feeding, the stylet-like mouth parts of the Psyllid penetrate the cells of the leaf, and a secretion from the salivary glands is probably forced in. The agent causing the changes in the growth of tomato and potato plants is still undetermined, but field and laboratory work suggested that it may possibly be an enzyme. Histological examination of stems from infested plants showed that the vascular system, by which food materials are transported from the leaves to the roots, is broken down and the destruction of internal phloem leaves a yellowish-brown or black mass. The large quantity of starch present in the pith of the stem indicated that the transfer of sugar from the leaves to the tubers had been interrupted.

In control experiments in various districts during 1932 and 1933 lime-sulphur (1 gal. lime-sulphur, 30–33° Bé., to 40 gals. water) gave the most satisfactory results. In 1933, tests on fields of early and late potatoes showed that the yield was always increased and sometimes trebled by treatment. Spraying should be carried out at sufficient pressure to cover the lower surfaces of the leaves completely, and should begin very soon after the Psyllids appear in the fields. At least two applications should be made, the second about two weeks after the first. If leaf-eating beetles are present, 2 lb. zinc arsenite may be added to each 40 U.S. gals. lime-sulphur. Against the Psyllid on tomatos 1 gal. lime-sulphur to 45 or 50 gals. water may be used, but care is needed because tomatos are more sensitive to this spray than potatoes.

List (G. M.). **Lime-sulfur for Tomato Psyllid Control.**—*Bull. Colo. agric. Exp. Sta.* no. 411, 14 pp. Fort Collins, Colo., June 1934. [Recd. December 1934.]

The following is based on the author's summary : The toxicity of lime-sulphur to *Paratrioza cockerelli*, Šulc [see preceding abstract], was largely due to the power of calcium pentasulphide and calcium tetrasulphide to take up large amounts of oxygen and to give off sulphur in finely divided particles. Control was obtained by the lethal effect of direct contact with the adults at the time of application, by repelling ovipositing females, and by a residual effect on the scale-like nymphs that settle on the sprayed surfaces. The difference between the

minimum strength that is toxic to Psyllids and the maximum strength that potatoes and particularly tomatos can support is so small that the materials must be selected and made up with great care. Commercial liquid lime-sulphur is sufficiently standardised to be used at recommended strengths [*loc. cit.*] on tomatos and potatoes. If the concentrate is prepared by the grower, the quicklime should be 95–98 per cent. pure, and should contain a minimum of magnesium oxide. The formula is 50 lb. quicklime, 100 lb. commercial ground sulphur, and water enough to make 50 U.S. gals. Directions for making it are given. Approximately 5 lb. dry lime-sulphur has the same sulphide sulphur content as 1 U.S. gal. proprietary liquid lime-sulphur, and should therefore be used at the rate of 1 lb. to 8 U.S. gals. water for potatoes and 1 lb. to 9 or 10 U.S. gals. for tomatos.

ARANT (F. S.). **Time of Turning Legumes and Planting Corn to avoid Injury from the Southern Corn Root Worm.**—*Circ. Ala. agric. Exp. Sta.* no. 65, 10 pp., 6 figs., 1 ref. Auburn, Ala., May 1934. [Recd. December 1934.]

Studies were carried out in Alabama during 1927–33 on the biology of *Diabrotica duodecimpunctata*, F., and the avoidance of injury to seedling maize by adjusting dates of turning the winter leguminous crops and of planting the maize. The results obtained up to 1929 have been noticed previously [*R.A.E.*, A **18** 620]. Brief notes are given on the appearance and bionomics of other insects that cause similar injury and may therefore be mistaken for this Galerucid. The life-cycle is completed in 4–5 weeks in warm weather, and there are 3 generations a year. Oviposition (in the soil) reaches its height in March and the beginning of April ; the young larvae, which hatch after about 12 days, feed on the roots of winter legumes and grasses, and when maize is grown on the same fields after winter legumes have been turned, they bore in the stalks [*cf.* also **17** 529]. In view of these facts, leguminous plants should be turned and disked before 15th April and the crop should not be sown until early in May, though planting may be done towards the end of April when the weather is warm and reasonably dry provided that the legumes are turned before the beginning of the month. It may be necessary to alter these dates by a few days in the southern and northern parts of the State, and they will be later during an extremely cool season.

COWAN (F. T.). **Grasshopper-bait Tests in Colorado.**—*Tech. Bull. Colo. Exp. Sta.* no. 7, 18 pp., 23 refs. Fort Collins, Colo., March 1934. [Recd. December 1934.]

The results of tests of baits for grasshoppers in Colorado in 1932 largely confirmed those of the previous year [*R.A.E.*, A **22** 573]. Dried beet pulp, when mixed with beet molasses and amyl acetate, was as effective a base as bran. Paris green has a slightly more rapid action and may be more toxic than sodium fluosilicate or sodium arsenite, but the last is much the cheapest. The composition of baits will vary according to the materials available in the various States ; in Colorado sodium arsenite (1 U.S. quart liquid or 2 lb. dry material), bran (100 lb.) and water (10–12 U.S. gals.) is recommended for dry lands, with the addition of beet molasses (2 U.S. gals.) and amyl acetate (3 oz.) for irrigated areas.

Entomology.—*Bull. Idaho agric. Exp. Sta.* no. 205 (Rep. 1933) pp. 40–48, 5 figs. Moscow, Idaho, May 1934. [Recd. December 1934.]

Three years' work on the pea Bruchid [*Bruchus pisorum*, L.] in Idaho [*R.A.E.*, A **22** 215, 418; **23** 32, etc.] showed that the incubation period lasted from 4 to 17 days in 1930 and from 7 to 14 in 1931, and that the larval and pupal stages may occupy 32 days. Many of the eggs are dislodged from the pods by the wind. The Bruchids are more numerous on self-sown peas in wheat fields than on spring planted peas, they develop earlier and more adults mature and escape after harvest. In the absence of these and others emerging from the shattered peas at harvest, infestation of the next season's crop could be largely prevented by harvesting the peas and storing them in closed bags before the beginning of the autumn emergence. *B. pisorum* is only of economic importance in Idaho in localities where the normal monthly temperature has an average minimum of at least 20°F. and the average precipitation is over 2 ins. during each of the winter months.

Sugar-beets should not be grown in this State if it has been determined before the planting date that the season will be favourable to the beet leafhopper [*Eutettix tenella*, Baker]. The larvae of the elm leaf beetle [*Galerucella luteola*, Müll.], which is increasing in south-western Idaho and caused severe damage to elms, were readily controlled with a spray of 4 lb. lead arsenate to 100 U.S. gals. water, and all stages were killed by one of 8 lb. lead arsenate in 100 U.S. gals. 1 per cent. oil emulsion containing pyrethrum extract (1 : 800). Two Capsids, *Lygus elisus*, Van Duzee, and *L. hesperus*, Knight, are numerous in many parts of the State [**22** 214] and have in certain instances caused complete failure of seed crops of lucerne. Two parasites attack the eggs and nymphs, respectively, but they are not of great importance. Complete and immediate control of the San José scale [*Aspidiotus perniciosus*, Comst.] was obtained with a dormant oil emulsion used at 3·2 per cent. strength. Good commerical control was apparent at harvest following the application of liquid lime-sulphur (5° Bé.); the dry form may be used at the rate of 33 lb. to 50 U.S. gals. water. A combination of 1 part kerosene extract of pyrethrum and 400 parts dilute dormant oil emulsion controlled this Coccid and the mineola moth [*Mineola scitulella*, Hulst.] on prune when applied at the time the buds were beginning to show white [*cf.* **20** 695]. In tests against the codling moth [*Cydia pomonella*, L.] on apple, no injury to fruit or foliage was caused by calcium arsenate applied alone or mixed with hydrated lime. Injury by the larvae, which consisted chiefly of "stings," was less when the lime was used. Pyrethrum extract (1 : 400) in 0·8 per cent. oil emulsion gave satisfactory control and was as effective as nicotine sulphate (1 : 1,600) in oil emulsion.

Lacroix (D. S.). **Tobacco Insects in 1933.**—*Bull. Conn. agric. Exp. Sta.* no. 359 pp. 377–382, 1 fig. New Haven, Conn., February 1934. [Recd. December 1934.]

Tobacco pests observed in Connecticut during 1933 included *Pheletes ectypus*, Say, *Epitrix cucumeris*, Harr., which was unusually abundant during June on all types of tobacco, *Epitrix parvula*, F., on plants grown in the shade, *Protoparce* (*Phlegethontius*) *quinquemaculata*, Haw., and *P.* (*P.*) *sexta*, Joh., which were more prevalent on plants grown in the sun than in the previous year, *Frankliniella fusca*, Hinds, which caused considerable damage to shade-grown and Havana seed tobacco

in one district, *Papaipema nitela*, Gn., *Lygus pratensis*, L., *Heliothis virescens*, F., and the wireworm, *Pheletes ectypus*, Say.

In tests of insecticides against *F. fusca*, which is numerous in hot dry seasons, but greatly decreases in numbers during and after rain, dusts proved ineffective because the particles rested on top of the hairs on the leaves, but sprays containing a pyrethrum product or nicotine sulphate and soap or penetrol, gave better results. None of the insecticides injured the leaves, but in hot weather and when the tobacco plants were badly wilted sprays of any kind tended to cause damage.

A tobacco by-product known as Richmond Filter dust was a satisfactory carrier for barium fluosilicate against *E. cucumeris*, which was also killed by pyrethrum sprays and dusts (especially the latter) applied against the thrips.

Dead larvae were found three days after a plot of tobacco infested by *Pheletes* was treated with calcium cyanide (100 lb. per acre) placed in furrows 4 ins. deep. A few living and no dead larvae were found where carbon bisulphide emulsion diluted with water (1 : 200) had been used in furrows 3 ins. deep at the rate of 1 U.S. qt. to 2 feet of furrow, and many dead larvae were found within 7 ins. of holes 3 ins. deep and 18 ins. apart that had been treated with 1 fl. oz. chloropicrin to each hole. Approximately 66 per cent. control was obtained after four days in another plantation, when an acre of infested soil was treated with 100 lb. calcium cyanide [*cf.* **14** 445] ; it was applied at a depth of $2\frac{1}{2}$ to $3\frac{1}{2}$ inches to each row of young plants at a time when 75 per cent. of the larvae were in the top three inches of soil. In tests with larvae confined in boxes covered with 50-mesh screen and buried at depths of 3, 6, 9 and 12 inches in the soil, chloropicrin emulsified with fish-oil soap and diluted with water at rates ranging from 1 : 50 to 12 : 5,000 was applied at 1 litre [$1\frac{3}{4}$ pints] per linear foot in furrows 3 inches deep and covered with soil ; 100 per cent. control was obtained after 48 hours, except with the weakest emulsion, which failed to kill larvae at a depth of 12 inches. Chloropicrin was extremely toxic to young plants. Planting may take place seven days after a strong emulsion has been applied, and five days after a weaker one, but the plants do not seem to grow so quickly as in untreated soil. Results of observations to determine the distribution of larvae in the soil at different times in the year are tabulated. They fed throughout the summer, but most of them were lower than 3 ins. in the soil except for a short period about the end of May.

Anderson (P. J.). **Tobacco Culture in Connecticut.**—*Bull. Conn. agric. Exp. Sta.* no. 364, pp. 713–810, lxi-lxv, 36 figs. New Haven, Conn., September 1934.

This bulletin includes a section (pp. 785–797) on the bionomics and control of insects recorded from tobacco plants in Connecticut, together with a key to the types of injury caused by them.

O'Kane (W. C.) & Baker (W. C.). **Studies of Contact Insecticides. VIII. 1. A Technique for Tracing Penetration of Petroleum Oil in Insect Eggs. 2. Some Determinations of Oil Penetration into Insect Eggs.**—*Tech. Bull. N. H. agric. Exp. Sta.* no. 60, 12 pp., 4 figs., 13 refs. Durham, N.H., June 1934. [Recd. December 1934.]

Four methods are described by which the penetration of petroleum oil into insect eggs was traced by the use of oil-soluble stains. By one

method the stain was incorporated in the oil and applied to the eggs, which were then cut into sections for examination, but in the other methods it was applied separately to sections of eggs that had been cut after the oil had been applied. With cockroach eggs the oil was found in the chorion and as streaks penetrating the parts of the segmenting egg; with grasshopper eggs it was found as minute globules scattered throughout the endochorion and as streaks along the body folds of the developing embryo.

Fragoso Viana (P. A.). **Invasão da Colonia por gafanhotos.** [The Invasion of the Colony of Mozambique by Locusts.]—*Bol. agríc. pecuário* 1933 no. 1–4 pp. 197–204, 11 maps. Lorenzo Marques, 1934.

In this account of the invasion of the Portuguese colony of Mozambique in 1932 by *Nomadacris septemfasciata*, Serv., and *Locusta migratoria migratorioides*, Rch. & Frm., maps, covering the period from August 1932 to 31st July 1933, show the direction of the swarms and the districts infested. The locust situation in Mozambique and adjoining countries since 1928 is briefly surveyed.

Steyaert (R. L.) & Vrydagh (J.). **Etude sur une maladie grave du cotonnier provoquée par les piqûres d'***Helopeltis*.—*Mem. Inst. colon. belge* (Sci. nat.) **1** fasc. 7, 55 pp., 7 pls., 15 figs., 7 refs. Brussels, 1933. [Recd. December 1934.]

In the Belgian Congo in 1930-32, damage involving the loss of 30 per cent. of the cotton crop was caused by a supposed disease, termed " shoot canker " on account of its principal symptoms. Its occurrence was irregular both in time and distribution, but appeared to be mainly confined to the forest zone. In laboratory studies, no fungi or bacteria were found that could possibly have been responsible for it.

In a small experimental plot various lesions appeared between 28th December 1931 and 15th January 1932, when the plants were flowering. A first-instar nymph of *Helopeltis* was discovered in this plot on 15th January, one of the second instar on 25th, and an adult of *H. sanguineus*, Popp., on 29th. When this adult was placed on several caged cotton plants, each developed characteristic lesions. Tests were therefore made with *H. bergrothi*, Reut., and *H. sanguineus*, and it was concluded that the symptoms of the so-called disease were due to the mechanical action of their feeding. The types of injury to shoots, branches, petioles, bolls, and leaves are described in detail. If the infestation takes place when only the cotyledons are showing, the Capsids may attack either these or the point of growth, so that the tissues die and the plant throws off other shoots. Where *Helopeltis* is fairly numerous, the plants are stunted and in extreme cases may become mere balls of tufted foliage.

The female of *H. bergrothi* lays about 30 eggs, which are embedded in the extremities of the branches and in the veins of the leaves and hatch in about 14 days. The nymphs and adults feed at night, and cause similar injury. In the absence of bolls, the nymphs prefer young leaves just opening from the bud, but will also attack the veins of the leaves, the petioles, the extremities of the branches or the tips of the shoots. During the day they generally remain hidden beneath the leaves. The adults shelter under the leaves during the sunny hours

but generally oviposit by day. They attack the ends of the shoots and branches, the petioles, and sometimes the leaves, but all other parts of the plant are ignored in the presence of bolls. This observation accounts for the severe outbreak of shoot canker in September and October 1931 in a locality where bolls were absent and all the punctures were concentrated on the ends of the shoots and branches. On another occasion, the Capsids were so numerous that there was no more room for them on the bolls and they were obliged to have recourse to the vegetative parts of the plants, many of which were killed. Punctures on the bolls are most numerous toward the apex and frequently occur in the furrow marking the separation of the carpels, with the result that the separated edges form within three days a little cavity favouring the introduction of saprophytes. *H. bergrothi* is polyphagous, and a list of its known food-plants is given. Cotton has been recorded as the preferred food-plant in Nigeria. Records of *H. bergrothi* and *H. sanguineus* on cotton in other countries, and in some cases of symptoms similar to those observed in the Belgian Congo [*R.A.E.*, A **14** 323] are quoted.

Studies are being carried out to determine the value in control of a fungus, *Sclerotium* sp., that was found infesting two dead examples of *Helopeltis*, and attempts have also been made to develop a strain of cotton resistant to the punctures of the Capsids.

In a supplementary note it is stated that Ghesquière considers *H. sanguinea* to be merely a form of *H. bergrothi*.

BIGGER (J. H.). **Notes on the Flight and Abundance of the Seed Corn Beetle,** *Agonoderus pallipes* **Fab.**—*Trans. Ill. Acad. Sci.* **26** no. 3 pp. 138–139. Springfield, Ill., March 1934.

The author here gives phenological data collected during 1923–33 relating to *Agonoderus pallipes*, F., in Illinois. There are two definite flight periods, in spring and autumn. The Carabids probably hibernate as adults, since the immature stages were only observed from early May to late June; there is no evidence of a second brood, although there is time for it to occur. When maize was grown in four year rotation, the percentage of infestation was considerably higher where animal manure was used than where sweet clover was ploughed under as a green manure preceding the maize, probably because the adults are attracted by decaying manure for feeding and oviposition. Their feeding habits were not determined. The time of ploughing was apparently unimportant.

CHANDLER (S. C.). **Codling Moth Hibernation in Banded Trees. (Abstract.)**—*Trans. Ill. Acad. Sci.* **26** no. 3 pp. 140–141. Springfield, Ill., March 1934.

Winter studies made in apple orchards in southern Illinois during 1931–33 to determine the relative percentages of larvae of *Cydia* (*Carpocapsa*) *pomonella*, L., overwintering under treated paper bands placed round tree trunks and of those hibernating in other situations led to the following conclusions: The bands catch over 75 per cent. of the larvae. Of the remainder more are usually found on the tree than on the ground. Of those on the tree 75 per cent. are found in the branches, and it is advisable to burn prunings since they contain an appreciable number of larvae.

Glasgow (H.). **The Feeding Habits of the Sinuate Pear Borer in Relation to Control Practices.**—*Bull. N.Y. St. agric. Exp. Sta.* no. 648, 31 pp., 15 figs. Geneva, N.Y., July 1934. [Recd. December 1934.]

Studies were undertaken in New York State on the feeding habits of adults of *Agrilus sinuatus*, Ol., the larvae of which attack any part of pear trees above ground, causing both direct mechanical injury and an extensive canker-like development along the course of their mines. Control measures have so far depended largely upon the removal or destruction of the larva in its mine or upon the use of repellents or mechanical barriers designed to prevent oviposition. The difficulty of locating the borers and the generalised nature of the attack have rendered them somewhat unsatisfactory.

In the laboratory, the chief food-plants of the adults in descending order of preference were pear, hawthorn, mountain ash and *Cotoneaster*, all of which are also infested by the larvae. The beetles live for a month or more in summer, and usually begin to feed extensively 2–3 days after emergence, the length of this interval varying according to the weather and the condition of the wood from which emergence takes place. As the females do not begin to oviposit for 10 days or more after emergence, there is an intervening period of several days when the application of arsenical sprays should be most effective. In view of the relatively long life of the beetle, however, and the prolonged period over which females oviposit, spraying after oviposition has commenced might be effective. Beetles fed readily on foliage sprayed heavily with lead arsenate, and the females then usually ceased both feeding and ovipositing and died within a few days. Field tests, based on these results, and the experience of growers indicate that *A. sinuatus* on pear may be successfully controlled by two applications of a lead arsenate spray (4–5 lb. to 100 U.S. gals.). The first spray should be applied about 10th June, followed by a second a fortnight later. Where invasion from surrounding plantations is to be feared, a third application may be made 10 days after the second.

Cage experiments to test the possibility of poisoning the young larvae, which burrow directly through the egg and into the bark of the tree, by spraying the bark with arsenicals before oviposition takes place indicate that heavy applications of lead arsenate may be of value. Females moving over the sprayed bark accumulate sufficient poison on their feet to kill them.

Random observations of the feeding of *Agrilus anxius*, Gory (bronze birch borer) and *Dicerca obscura*, F. (flat-headed hickory borer) and their reaction to arsenical sprays are also recorded. A male and female of *D. obscura* fed readily in confinement on hickory leaves sprayed with lead arsenate at the rate of 6 lb. to 100 U.S. gals., and were dead after 4 days. In a test in which 5 females and a male of *A. anxius*, captured on birch on 24th June were caged with birch leaves, the beetles declined to feed readily, though one female had laid 10 eggs by 28th June and 28 by 8th July, when the first eggs began to hatch, practically without feeding. Although 4 of the beetles were still alive on 8th July, they could not be induced to feed and no test with arsenicals was attempted. This very limited test suggests that the adults of *A. anxius* do not feed so extensively as those of *A. sinuatus* and are therefore likely to be more difficult to control by means of arsenical sprays.

Borden (A.). **The Tank-mixture Method for Dormant Oil Spraying of Deciduous Fruit Trees in California.**—*Bull. Calif. agric. Exp. Sta.* no. 579, 20 pp., 5 figs. Berkeley, Calif., July 1934. [Recd. December 1934.]

Owing to differences in efficiency of commercial oil emulsions for dormant sprays [*R.A.E.*, A **22** 646], experiments were begun in northern California in 1930 on the tank-mixture method of preparation [*cf.* **18** 481 ; **19** 216 ; **20** 586], which would also reduce the cost of spraying [**18** 482]. The most satisfactory oil contained at least 70 per cent. unsulphonated residue and had a viscosity of 100–120 secs. Saybolt at 100°F., and the best spreader was powdered blood albumen (about 4 oz. to 100 U.S. gals. spray), which was highly soluble and contained 3 parts finely ground earth. Flat agitators with square ends were found superior to the propeller type [**22** 96], and recommendations are given for their use in tanks of various dimensions and with engines of different horse-power. A new type of filler box that does not extend down into the tank and interfere with agitation was designed for these tests.

As a result of field experiments on apple, pear, prune and apricot during 1931–33, in which sprays made with tank-mixed oil gave control generally superior to those made with commercial emulsions, recommendations are given for the use of the following sprays prepared by the tank mixture method : Against *Aspidiotus perniciosus*, Comst., the oil should be used at the rate of 3 per cent. when the bark is relatively smooth and the Coccid not incrusted, with the addition of 1½–2 lb. caustic soda per 100 U.S. gals. spray, when its use is warranted by moss on the tree ; against *Lecanium corni*, Bch., 2–3 per cent. oil should be used on prunes, 3 on apricots or not less than 4 when Bordeaux mixture is incorporated ; against the egg masses of the fruit tree leaf-roller [*Tortrix argyrospila*, Wlk.] 4 per cent. should be used in the full dormant period and 5 with Bordeaux. Against the eggs of the brown mite [*Bryobia praetiosa*, Koch.], which is usually destroyed by sprays against Coccids, 2 per cent. oil gave perfect control on dormant prunes. Sprays made by this method were used extensively in northern California during 1933 ; they gave good results, and no injury to the trees was recorded.

Russo (G.). **Principali cause nemiche delle piantagioni di cotone nella Somalia Italiana.** [The chief Enemies of Cotton Plantations in Italian Somaliland.]—*Agric. colon.* **28** no. 11 pp. 561–572, 6 figs. Florence, November 1934.

This is a survey of the insects, fungi and bacteria observed in 1930 attacking cotton in Italian Somaliland. The insects of economic importance have already been noticed [*R.A.E.*, A **20** 339, 393, 394 ; **21** 60, etc.].

Khatib (M. H.). **The Life-history and Biology of** *Galerucella birmanica* **Jac. (Coleoptera, Phytophaga, Chrysomelidae, Galerucinae) and the external Morphology of Larva and Pupa, Part I.**—*Indian J. Agric. Sci.* **4** pt. 4 pp. 715–732, 4 pls., 4 figs., 2 pp. refs. Delhi, August 1934. [Recd. December 1934.]

The morphology of the larval and pupal stages of *Galerucella birmanica*, Jac., which does great damage to water-nut (*Trapa bispinosa*), one of the chief foods in many villages in India, is described

in detail. The larvae, which move from leaf to leaf, and to a less extent the adults, retard the growth of the plants by feeding on the upper surface of the leaves, which float on the surface of the water, and consequently reduce the number of flowers and fruits produced. If left undisturbed, they may destroy the entire plantation and even with daily destruction of all stages in large quantities, there is ordinarily a loss of at least 40 per cent. of the crop. A few hibernating beetles were found in cracks formed in the sides of reservoirs. The adults disappear by the end of December and re-appear about the time the young seedlings come up in mid-May or the beginning of June. The females begin to oviposit on the upper surface of the foliage shortly after pairing. A total of 30–100 eggs, which hatch in 6–9 days, are laid in clusters of 10–30. They succumb to submergence in water, complete dryness or extremes of temperature. The larval stage lasts 15–20 days and the pupal 7–10. In captivity, adults did not pair for at least a week after emergence.

This Galerucid spreads to the young plants produced vegetatively, and its eggs and larvae are taken with these when they are transplanted to other localities. Steps should be taken to see that all transported plants are free from infestation.

Hesse (E.). **Insektenfrass an** *Lilium martagon* **L.** [Insect Feeding on *L. martagon*.]—*Z. wiss. InsektBiol.* **27** no. 5–6 pp. 85–87. Berlin, November 1934.

The author compares the results of some of his observations on *Lilioceris* (*Crioceris*) *lilii*, Scop., as a pest of *Lilium martagon* in Germany [*R.A.E.*, A **20** 507] with those recorded in earlier literature [*cf.* also **21** 124]. Schröder (1897) suggested that the females hibernate after having been fertilised, but this is considered unlikely, for in spring when the lilies are only a few inches high and their leaves are still unexpanded, mating beetles occur on them, the earliest having been observed on 26th April in 1932. Schröder believed that there are several generations a year because larvae and adults occur together. The author found eggs, larvae and adults together on the leaves, but mating beetles only up to the end of July. No newly hatched larvae were seen after 31st July and no adults after 2nd September. The intervening time would correspond with that of development to the adult stage, and these late adults would be those that hibernate and renew the cycle in spring. Eggs laid late would fail to develop.

The author also observed *Tortrix* (*Cacoecia*) *podana*, Scop., on *L. martagon*, but the infestation was purely accidental.

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Lindinger (L.). **Die nunmehr giltigen Namen der Arten in meinem "Schildlausbuch" und in den "Schildläusen der mitteleuropäischen Gewächshäuser."** [The now valid Names of the Species in my "Coccid Book" and in "The Scale-insects of Central European Greenhouses" [*R.A.E.*, A **13** 102].]—*Ent. Jahrb.* **44** pp. 127–149. Leipzig, 1935.

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MARCOVITCH (S.). **The Woolly Apple Aphid** [*Eriosoma lanigerum*, Hsm.] **in Tennessee.**—*Bull. Tenn. agric. Exp. Sta.* no. 151, 16 pp., 15 figs., 1 p. refs. Knoxville, Tenn., March 1934. [Recd. December 1934.] [*Cf. R.A.E.*, A **22** 641.]

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SIMMONDS (J. H.). **Bunchy Top of the Banana** [transmitted by *Pentalonia nigronervosa*, Coq.] **and its Control** [in Queensland].—*Adv. Leafl. Dep. Agric. Stk Qd* no. 12, 4 pp., 1 pl., 2 figs. Brisbane, March 1934. [Recd. January, 1935.] [*Cf. R.A.E.*, A **18** 31 ; **21** 570 ; **22** 424.]

MALENOTTI (E.). **La tignola orientale del pesco** (*Laspeyresia molesta*, Busck) **a Verona.** [*Cydia molesta* on Peach in Verona.]—*Atti Accad. Agric. Sci. Lett. Verona* (5) **12** pp. 145–151, 5 pls. Verona, 1934. [*Cf. R.A.E.*, A **22** 434.]

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